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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 8, NUMBER 19
OCTOBER 1, 1975

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SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

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A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 8, NUMBER 19
OCTOBER 1, 1975

W75-09351 -- W75-09850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

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Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

THE MICROWAVE EMISSION SPECTUM FROM SPARKING WATER DROPS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
For primary bibliographic entry see Field 2B.
W75-09614

2. WATER CYCLE

2A. General

RECHARGE SIMULATION MODEL,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
D. M. Manbeck.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 502, $3.25 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 21 p, 2 fig, 4 tab, 2 ref. OWRT A-028-NEB(1). 14-31-0001-5027.

Descriptors: *Artificial recharge, Model studies, Aquifers, Groundwater, *Mathematical models, *Simulation analysis, Computer programs, *Soil moisture, *Groundwater movement.

A mathematical model simulating the movement of water from the soil surface to groundwater was developed and programmed for the IBM 360/65 computer in Fortran IV language. Components of the model include precipitation, irrigation amounts, air temperature, saturation soil moisture content and hydraulic conductivity, volumetric moisture vs. moisture potential relationship, and thickness and number of strata. The model generates the amount of water from precipitation and irrigation sources moving vertically downward from one soil layer to the next on a monthly basis with given initial conditions. The input values and mathematical relationships are used to simulate the following processes: (1) interception by vegetation; (2) surface runoff; (3) evapotranspiration; and (4) percolation. The percolation or moisture movement from the last layer just above the water table is considered recharge to the groundwater system. Flow of moisture in the soil is assumed to be one dimensional and occurs under saturated and unsaturated conditions. The concept of one-dimensional flow restricts the accuracy of the model because soil moisture movement is very complicated and more complex relationships are not amenable to easy solution.
W75-09518

URBAN LAWN INFILTRATION RATES AND FERTILIZER RUNOFF LOSSES UNDER SIMULATED RAINFALL,
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
For primary bibliographic entry see Field 5B.
W75-09592

OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 4A.
W75-09594

GROUND-WATER LEVEL IN THE FLOOD PLAIN AND ADJACENT UPLANDS OF THE SANGAMON RIVER,
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 4B.
W75-09599

SURFACE WATER RESOURCES OF ST. JOHNS RIVER, FLORIDA,
Reynolds, Smith and Hills, Jacksonville, Fla.
Z. Qureshi.
Water Resources Bulletin, Vol 11, No 3, p 568-574, June 1975. 2 fig, 4 ref.

Descriptors: *Surface water availability, *River basins, *Florida, *Water resources, Environment, Drainage area, Consumptive use, Hydraulic gradient, Average flow, Swamps, Hydrology, Channel flow, Springs, Low flow, Backwater, Storage capacity, Flow characteristics, Tidal effects, Navigation.
Identifiers: *St. Johns River(Fla), Reverse flow, Oklawaha River basin(Fla).

The St. Johns River basin is the largest watershed entirely within Florida, and it is one of the few northward flowing rivers in the United States. The river basin contains 29,606 sq km of which 24,424 sq km are drained by the river and its tributaries. The remainder drains into the Atlantic Ocean of the Intracoastal Waterway. Its largest sub-basin is the Oklawaha River Basin, which has a drainage area of 7433 sq km. Ground elevations range from sea level to 61 m above mean sea level in the main river basin and as high as 91 m above mean sea level in the Oklawaha River basin. The surface water resources of the St. Johns River and the existing consumptive uses were investigated. The analysis revealed that the river is an extremely large and valuable resource which has been underutilized and could play a much stronger role in serving the needs of the people in the basin. (Roberts-ISWS)
W75-09604

GEOGRAPHIC VARIATION OF THE STATISTICAL PARAMETERS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2B.
W75-09605

REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
J. P. Riley, E. K. Israelsen, and G. B. Shih.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 517, $4.25 in paper copy, $2.25 in microfiche. Completion Report PRWG87-1, April 1975. 69 p, 21 fig, 5 tab, 64 ref, 4 append. OWRT B-047-UTAH(1). 14-31-0001-3340.

Descriptors: Water resources, Urban hydrology, Hydrology, Hydrologic cycle, *Storm runoff, Computer models, Mathematical models, *Texas, Small watersheds, Peak discharge, *Regional analysis, Rainfall-runoff relationships, Simulation analysis, *Regression analysis, Model studies, *Runoff forecasting.
Identifiers: Austin(Tex), Houston(Tex), Dallas(Tex), Fort Worth(Tex), *Urban watersheds.

A general method was developed for estimating runoff rates and associated confidence limits of a given recurrence interval for ungaged small urban watersheds. The utility of the method developed was demonstrated through its application to a southeast region of Texas. Some 200 historical rainfall-runoff events from 40 watersheds in Houston, Austin, Dallas, and Fort Worth urban areas were analyzed. Watershed data such as drainage area, percent of urbanized area, channel length, average channel slope, land slope, and soil type are documented. Total rainfall amounts intensities, durations, and mass-time distributions were determined for each storm and used to develop a rainfall generating model. Peak runoff, total runoff volume, and runoff duration are also determined. Statistical analyses were performed to develop regression models to relate peak runoff and total runoff volume with rainfall and watershed characteristics as independent variables. An urban watershed runoff model, based on the Utah Simulation Model, was used to identify the model parameters for each watershed by reproducing the historical storms. Relationships between model parameters and measured watershed variables were established. By combining the rainfall generating model and the watershed runoff model, peak runoff rates and total runoff volumes for different conditions were generated for chart construction.
W75-09621

MATHEMATICAL MODELS IN HYDROLOGY,
Institute of Hydrology, Wallingford (England).
R. T. Clarke.
Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 19, 1973. 282 p, 6 fig, append, 79 ref.

Descriptors: Hydrology, *Computer models, *Mathematical models, Water resources development, *Model studies, *Hydrologic models, Simulation analysis, Water management(Applied), Arid lands, *Reviews, *Bibliographies.

This manual attempts to advance the use of mathematical models in hydrology from a theoretical level to practical application. The state-of-the-art is reviewed; models are useful in extracting the maximum amount of information from available data. Since data are often slight in developing countries, particularly in sparsely inhabited arid regions, such models, if used with caution, could have great application in such nations. Various models are examined, and the appendix contains computer programs. A decision-making method is described that is cheap, flexible, and competent in working with meager data bases. (Bowden-Arizona)
W75-09624

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,
Geological Survey, Salt Lake City, Utah.
B. A. LaPray.
Utah Department of Natural Resources, Salt Lake City, Information Bulletin No 23, 1975. 58 p, 4 tab.

Descriptors: *Bibliographies, *Water resources, *Publications, *Utah, Hydrologic data, Surface waters, Groundwater, Water quality, Streamflow, Runoff, Hydrology, Hydrogeology, Aquifer characteristics, Groundwater movement, Wells, Floods, Chemical analysis, Information retrieval.

This bibliography contains a complete listing to December 31, 1974, of reports relating to the water resources of Utah prepared by personnel of the U.S. Geological Survey. Discussions of the related subjects of geology, hydrology, and chemical quality of the water are included in many of the reports. The reports were, for the most part, prepared by personnel assigned to the Water Resources Division, Utah District, in cooperation with State and local agencies. The bibliography is divided into four major parts: (1) publications of the Geological Survey; (2) publications by agencies of the State of Utah; (3) other publications--reports prepared by Survey personnel, but published by other agencies or by professional organizations in their journals; and (4) open-file reports of the Geological Survey. (Woodard-USGS)
W75-09718

HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W75-09722

THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W75-09726

A LABORATORY INVESTIGATION OF SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2E.
W75-09744

A LABORATORY RAINFALL SIMULATOR FOR INFILTRATION AND SOIL DETACHMENT STUDIES,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 2G.
W75-09746

A NON-LINEAR RAINFALL-RUNOFF MODEL, PROVIDING FOR VARIABLE LAG TIME,
Newcastle-upon-Tyne Univ. (England). Dept. of Engineering Mathematics.
D. W. Reed, P. Johnson, and J. M. Firth.
Journal of Hydrology, Vol 25, No 3/4, p 295-305, May 1975. 4 fig, 1 tab, 9 ref.

Descriptors: *Runoff, *Unit hydrographs, *Rainfall-runoff relationships, *Hydrograph analysis, Hydrology, Rainfall, Hydrographs, Analysis, Storage, Distribution, Discharge(Water), Precipitation excess, Model studies, Watersheds(Basins).
Identifiers: *Lag time.

The cascading reservoir analogue of the rainfall-runoff process was extended, by the introduction of a third parameter, to apply to catchments exhibiting variable lag times. A semi-empirical relationship between lag time and storage was incorporated and the total-runoff hydrograph was computed. The resulting nonlinears, three-parameter model produced better representation of an observed rainfall-runoff event than the linear, gamma-distribution model. (Adams-ISWS)
W75-09753

2B. Precipitation

METHODOLOGICAL APPROACHES IN HAWAIIAN FOG RESEARCH,
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 508, $3.75 in paper copy, $2.25 in microfiche. Technical Report No 85, March 1975. 34 p, 16 fig, 2 tab, 16 ref. OWRT A-041-HI(1). 14-31-0001-4011.

Descriptors: *Fog, *Precipitation(Atmospheric), *Raindrops, Water balance, Rainfall, Wind, *Hawaii, Networks, Methodology, Computer programs, Instrumentation, Measurement, Sampling.
Identifiers: *Fog analysis computer program, *Hawaiian upslope fog, *Droplet size, *Fog sampling network, Louvered screen, Fog gage, Fog interceptor, Grunow gage.

Recent studies have demonstrated the important moisture contribution from fog precipitation in mountain areas on the island of Hawaii. Research methodologies useful in the study of Hawaiian upslope fog were investigated, included: (1) development of an improved fog gage; (2) development of indirect approximation methods for estimating average droplet sizes during precipitation episodes and separating fog and rainfall components; (3) establishment of an extensive fog sampling network on the island of Hawaii employing continuous recording equipment, for both rain, fog, and wind; (4) development of an original computer program for detailed temporal and spatial analysis of rain, fog, and wind parameters.
W75-09526

WEATHER SATELLITE PICTURE RECEIVING STATIONS, APT DIGITAL SCAN CONVERTER,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W75-09588

THE EVOLUTION OF DROP SPECTRA DUE TO CONDENSATION, COALESCENCE AND BREAKUP,
Arizona Univ., Tucson. Inst. of Atmospheric Physics.
K. C. Young.
Journal of the Atmospheric Sciences, Vol 32, No 5, p 965-973, May 1975. 10 fig, 24 ref.

Descriptors: *Coalescence, *Condensation, *Nucleation, *Drops(Fluids), Numerical analysis, Clouds, Model studies, Rain, Stochastic processes, Supersaturation.
Identifiers: Warm rain processes, Drop breakup, Collection efficiency, Drop collision.

A numerical model of warm rain processes incorporating activation of cloud condensation nuclei, drop growth by condensation and stochastic coalescence, and drop breakup was described. A collisional breakup model was compared to a spontaneous disintegration model and found not only to dominate over the spontaneous disintegration model but to produce an exponential spectrum in fair agreement with average observed drop spectra. The steady-state spectrum was found to be quite insensitive to the number of satellite drops formed by collision or their size distribution. The effect of the finite-difference solution to the collection and breakup equations was analyzed. A properly stochastic formulation for finite time steps was presented but found to differ only slightly from the simpler, 'discrete' formulation. Time steps of 5 s and 45 size categories were found adequate to describe the essential quantitative features of more intensive treatments. The model results were found to be somewhat sensitive to values used for the collection efficiency. (Jones-ISWS)
W75-09597

GEOGRAPHIC VARIATION OF THE STATISTICAL PARAMETERS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,
Central and Southern Florida Flood Control District, West Palm Beach.
A. N. Shahane, D. Thomas, and P. Bock.
Water Resources Bulletin, Vol 11, No 3, p 584-598, June 1975. 9 fig, 3 tab, 5 ref.

Descriptors: *Variability, *Climatology, *Hydrology, *Meteorology, *Statistics, *United States, Parametric hydrology, Analysis, Drainage area, Geographical regions, Time-series analysis, Correlation analysis, Topography, Statistical methods, Data processing.
Identifiers: *Variance analysis, Autocorrelation coefficients, Serial correlation coefficients.

A methodology was developed to assess variations of statistical parameters of the hydrologic cycle of the United States by generating seven hydrometeorological time series for 76 small and 10 large drainage basins. Two conceptually different approaches (one using directional strips of large combined watersheds and the other using analysis of variances) were employed to explore the geographic variation of the statistical parameters (autocorrelations and explained variances) in question. Results adequately indicate the correspondence between these variations and the observed topographic, climatologic, and hydrologic characteristics over the United States. The results indicated a noticeable change in autocorrelation coefficients for precipitation and evapotranspiration series on either side of the Appalachian and Rocky Mountains. Analysis of variance indicated a significant linear north-south effect only for evapotranspiration series. Analysis of variance of explained variances of hydrometeorological components indicated a signficant quadratic variation in the north-south direction for runoff, precipitation, and change in storage series. In east-west directions, runoff and precipitation series showed significant variation in their explained variance values. (Roberts-ISWS)
W75-09605

A WIND TUNNEL INVESTIGATION ON ICE MULTIPLICATION BY FREEZING OF WATER-DROPS FALLING AT TERMINAL VELOCITY IN AIR,
California Univ., Los Angeles. Dept. of Meteorology.
For primary bibliographic entry see Field 2C.
W75-09613

THE MICROWAVE EMISSION SPECTUM FROM SPARKING WATER DROPS,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
G. D. Sower.
Journal of Geophysical Research, Vol 80, No 3, p 355-365, January 20, 1975. 7 fig, 27 ref. ONR Contract N00014-67-A-0267-0157, NSF Grant GA-32591X.

Descriptors: *Drops(Fluids), *Electrical properties, *Radiation, Microwaves, Clouds, Radio waves.
Identifiers: *Collisions, *Sparks, Radiometer, Liquid water content.

The microwave emission spectrum was obtained for the discharge during collision of two oppositely charged water drops of equal size in the absence of an external electric field. The power spectra obtained for drops 1.00 and 1.50 mm in diameter covering the frequency range 3291-10,940 MHz show pronounced maximums and minimums, unlike blackbody radiation, which follows an sq f law, where f is the frequency. These results imply that radiation from sparking drops is separate from the thermal radiation from clouds. The variation of radiated energy E with drop size d and charge Q is found at 9210 MHz to be E proportional to Q to the 6.6 power divided by 10 to the 1.96d power. For colliding drops of equal size, the radiated intensity is dependent on the total charge neutralized between the drops and not on how the charge is initially distributed, even when one drop is initially uncharged. On the basis of the experimental results a simple cloud model was used to calculate contributions to the antenna temperature of a radiometer from (1) the electrical activity due to sparking drops and (2) the cloud liquid water present in the antenna beam. It appears feasible to utilize a dual-wavelength radiometer as a remote sensing probe to determine simultaneously the liquid water content and the electrical activity in certain types of storms. (Jones-ISWS)
W75-09614

A STOCHASTIC MODEL OF N-DAY PRECIPITATION,
Ecole Polytechnique, Montreal (Quebec).
P. Todorovic, and D. A. Woolhiser.
Journal of Applied Meteorology, Vol 14, No 1, p 17-24, February 1975. 6 fig, 1 tab, 7 ref, append.

Descriptors: *Precipitation(Atmospheric), *Stochastic processes, Markov processes, Analytical techniques, Model studies, Probability, Numerical analysis.
Identifiers: Distribution functions, Binomial-exponential model.

General expressions were derived for the distribution functions of the total amount of precipitation and the largest daily precipitation occurring in an

n-day period. Two special cases were considered: (1) the probability of occurrence of precipitation on any day in an n-day period is a constant (binomial counting process) and (2) the probability of occurrence of precipitation on any day depends on whether the previous day was wet or dry (Markov chain counting process). The distribution function for daily precipitation was assumed to be exponential. Analytic expressions were derived for the distribution functions for total precipitation or precipitation greater than a threshold. For the numerical example chosen, the Markov chain-exponential model was slightly superior to the binomial-exponential model. This stochastic model seemed to have several advantages over present approaches. (Jones-ISWS)
W75-09747

RECENT AFRICAN RAINFALL PATTERNS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology.
M. Tanaka, B. C. Weare, A. R. Navato, and R. E. Newell.
Nature, Vol 255, No 5505, p 201-203, May 15, 1975. 4 fig, 1 tab, 11 ref.

Descriptors: *Rainfall disposition, *Africa, *Distribution patterns, Precipitation(Atmospheric), Rainfall, Isohyets, Analysis, Evaluation, Average, Seasonal, Summer, Hyetographs.
Identifiers: *Sahel.

Presented were the results of a pilot study aimed at creating a more concrete basis for discussion of the variability in both space and time of rainfall in the Sahel. The Sahel region was defined as that extending across the entire African continent between 10 deg N and 20 deg N. The area west of approximately 30 deg E is a fairly regular plain; to the east are the Nile River Basin of Sudan and the mountains of Ethiopia. The atmospheric circulation system that brings rain to this region is the ascending branch of the tropical Hadley cell, often called the Intertropical Convergence Zone (ITCZ), which moves north of the equator in the Northern Hemisphere summer. This system usually reaches its most northerly position in August, the wettest month over the Sahel. The analysis was concentrated on August for years with good climatic records (1941-1973). Average August rainfall patterns were presented for 1941-1950 and 1951-1960, and the years 1964, 1968, and 1972. The Sahel region had about 10% more rainfall during 1951-1960 than in 1941-1950. The rainfall pattern for August 1964 was similar to those for 1951-1960. The lowest precipitation during 1941-1973 was in 1972 and 1973. (Humphreys-ISWS)
W75-09766

DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP) USER'S GUIDE,
Air Weather Service, Scott AFB, Ill.
For primary bibliographic entry see Field 7B.
W75-09770

DROUGHT, A RECURRENT ELEMENT OF CLIMATE,
Maryland Univ., College Park. Graduate Program in Meteorology.
H. E. Landsberg.
Paper presented on June 6, 1974, at 26th Meeting of Executive Committee of World Meteorological Organization, Geneva, Switzerland, 1974. 49 p, 26 fig, 2 tab, 40 ref.

Descriptors: *Drought, *Africa, *Forecasting, *Arid climates, *Climatology, *Meteorological data, Statistics, Statistical models, Environmental effects, Exploitation, Biomes, Deserts, Ecology, Dry seasons, Weather modification.
Identifiers: Sahel, Dust bowl, Desertification.

Drought is a recurrent element of climate and there is no need to invoke climatic change as a cause each time drought occurs. Research in past decades has made it possible to predict the risk of drought in different regions. Numerous examples are given of the applicability of statistical methods in predicting droughts and other weather anomalies. Humans heighten the consequences of drought in arid and semi-arid regions when their exploitation of the land lessens its ability to recover. The Sahel in Africa today and the Great Plains in the United States in the 1930's are examples of such an overuse. Drought is part of the climatic pattern in all parts of the world. Dry regions bear the brunt of these fluctuations since their ecosystems are more fragile than moister regions. Where in the past nomadism and migration were a way out of drought, population pressures and political aspects now aggravate the problem. Anticipation of droughts can mitigate their consequences. Current techniques, including weather modification, can alter them. (Bowden-Arizona)
W75-09799

2C. Snow, Ice, and Frost

OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 4A.
W75-09594

THE FRAGMENTATION AND ELECTRIFICATION OF FREEZING DROPS,
Toronto Univ. (Ontario). McLennan Lab.
R. J. Kolomeychuk, D. C. McKay, and J. V. Iribarne.
Journal of the Atmospheric Sciences, Vol 32, No 5, p 974-979, May 1975. 4 fig, 5 tab, 23 ref.

Descriptors: *Drops(Fluids), *Freezing, *Electrical properties, Saturation, Laboratory tests, Nitrogen, Ice, Crystals, Gases.
Identifiers: *Fragmentation, *Electrification, Splintering, Cracking.

Drops in the size range 1.2 to 1.9 mm were frozen while floating in a nitrogen stream. Frequency of splitting and cracking was found to be 80-90% when the gas was dry and 57% when it was saturated with water vapor. During freezing, about half of the drops acquired charges (of both signs) in the order of several tenths of a picoColumb and the sam proportion (in separate experiments) produced splinters, giving an average of about 10 splinters per frozen drop. (Jones-ISWS)
W75-09598

A WIND TUNNEL INVESTIGATION ON ICE MULTIPLICATION BY FREEZING OF WATER-DROPS FALLING AT TERMINAL VELOCITY IN AIR,
California Univ., Los Angeles. Dept. of Meteorology.
H. R. Pruppacher, and R. J. Schlamp.
Journal of Geophysical Research, Vol 80, No 3, p 380-386, January 20, 1975. 1 fig, 1 tab, 53 ref.

Descriptors: *Drops(Fluids), *Freezing, *Clays, *Nucleation, Ice crystals, Supercooling, Rime, Aerosols, Laboratory tests, Meteorology, Ice.
Identifiers: *Splintering, *Fragmentation.

The freezing behavior of waterdrops nucleated by contact with clay particles was studied. The experimental setup utilized a cloud tunnel which allowed retrieval of the frozen particles from the airstream for study under a microscope. The mode of fragmentation of freezing waterdrops was investigated. It was found that, depending on the drops surface temperature, up to 42% of the drops frozen by contact nucleation with a clay aerosol transformed into ice particles with surface breaks that resulted from ejection of 1 splinter, whereas only up to 8.5% shattered into 2-3 fragments and only up to 6.3% totally ruptured into a large (3) but undetermined number of very small ice fragments. Drops frozen by clay particles submerged in a drop did not shatter and they produced much fewer frozen drops with surface breaks. It was concluded that ice multiplication by freezing and splintering of freely falling drops cannot account for the large concentration of icy crystals found in certain clouds with top temperatures warmer than -10C, although, the mechanism cannot be ignored. It may contribute to the start of the ice multiplication mechanism which, according to Hallett and Mossop, is efficiently carried on by the production of ice splinters during riming. (Jones-ISWS)
W75-09613

ARCTIC BARRIER FORMATION,
Exxon Production Research Co., Houston, Tex. (assignee)
For primary bibliographic entry see Field 8A.
W75-09644

HEAT TRANSFER IN SOIL-WATER-ICE SYSTEMS,
Dames and Moore, Washington, D.C.
A. Mohan.
Journal of the Geotechnical Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No GT2, Paper 11123, p 97-113, February 1975. 6 fig, 20 ref, 2 append.

Descriptors: *Heat transfer, *Frozen soils, *Ice, *Mathematical models, Theoretical analysis, Finite element analysis, Soil water, Soil mechanics, Temperature, Soils, Freezing, Thawing, Equations, Computer models, Water, Soil engineering, Frost action, Conduction.

The finite element method has an excellent solution capability for problems requiring transient temperature distribution under time-dependent temperature initial and boundary conditions. Some exceptional features in handling are: space variations of temperature-dependent material properties, irregular boundary geometries of problem regions, temperature and heat flux boundary conditions at any point in the problem region, and freedom in varying the size of the finite discretization within the problem region. Presented was a general computer-oriented solution technique for geotechnical problems of heat conduction, including the effect of latent heat generation and absorption. A variational principle was applied for initial boundary value problems of unsteady heat flow, and the finite elements method was used to generate approximate solutions to plane and axisymmetric problems. Variation in physical and thermal properties of materials with both temperature and space, and functional relationships between the amount of water frozen and the temperature were taken into account automatically during the process of heat conduction. Comparison of computer solutions with exact solutions of two examples showed an excellent agreement, even for a coarse element representation of an infinite medium in a finite region. The finite element method is potentially a powerful tool for prediction of temperature distribution and rate of thaw (freeze) of frozen (unfrozen) media due to an imposed source (sink) of heat and under natural environmental conditions. (Humphreys-ISWS)
W75-09742

THE PREDICTION OF LAKE HURON LAKE-EFFECT SNOWFALL SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Geography.
K. F. Dewey.
Journal of Applied Meteorology, Vol 14, No 1, p 3-7, February 1975. 4 fig, 1 tab, 9 ref.

Descriptors: *Forecasting, *Lake Huron, *Snowfall, Snow, Energy budget, Evaporation, Ice cover, *Data collections, Lakes, Theoretical analysis, Statistical methods, Great Lakes region, Heat budget.

Identifiers: Bulk aerodynamic method, Discriminant analysis.

Data were collected during the 1971-1972 snowfall season for the Lake Huron basin. The bulk aerodynamic approach, as formulated by Priestley(1959), was utilized to estimate the daily average flux of heat and moisture over the lake. It was hypothesized that discriminant analysis could be employed to determine the threshold value (discriminant index) of the energy flux which is necessary for the occurrence of the lake-effect snowfall system. To determine the validity of this threshold value, the discriminant index was applied to a series of historical data. The results of this analysis indicated that the discriminant index could be utilized to forecast lake-effect snowfall days. (Jones-ISWS)
W75-09748

THE COMPOSITE ROUGHNESS OF ICE COVERED STREAMS,
Iowa Inst. of Hydraulic Research, Iowa City.
M. S. Uzuner.
Journal of Hydraulic Research, Vol 13, No 1, p 79-102, 1975. 8 fig, 2 tab, 7 ref. NSF Grant GK-35918X, Army Contract DACW25-72-C-0012.

Descriptors: *Hydraulics, *River flow, *Equations, *Ice cover, *Flow resistance, Streamflow, Resistance, Ice, Hydraulic radius, Winter, Drag, Streams, Roughness(Hydraulic), Friction.
Identifiers: Friction factors.

The various techniques proposed for calculating the composite roughness of ice-covered streams were reviewed and evaluated. Evaluation stressed the roughness formula used and the method of dividing the flow into bed and ice cover affected portions. A graph was presented to assist in application of Carey's method. The various predictors were compared and their application was discussed. The procedures proposed by Hancu and Larsen were recommended. Hancu's method was preferred because it used the Darcy-Weisbach friction factor. (Adams-ISWS)
W75-09758

HURONIAN GLACIATION AND POLAR WANDER FROM THE GOWGANDA FORMATION, ONTARIO,
Windsor Univ. (Ontario). Dept. of Geology.
D. T. A. Symons.
Geology, Vol 3, No 6, p 303-306, June 1975. 4 fig, 2 tab, 42 ref.

Descriptors: *Glaciation, *Geology, *On-site investigations, *Canada, Lake Huron, Evaluation, Sedimentary rocks, Diagenesis, Polar regions, Paleosols.
Identifiers: *Paleoaphebian glaciation, *Gowganda formation, Ontario, Elliot Lake, Paleomagnetic analysis, Paleoaphebian polar wander.

The origin of the till-like conglomerate of the Huronian Gowganda Formation is controversial. The argument centers on whether the conglomerate was deposited directly from the ice as a normal till in a glacial polar climate or whether the boulders were ice rafted and dropped into sediments deposited around an ice sheet in a periglacial subpolar climate. Paleomagnetic analysis provides a direct geophysical method to locate the pole position at the time of deposition and thus helps distinguish the hypotheses. The paleomagnetism of sedimentary rocks from the Huronian Gowganda Formation was studied for 16 sites near Elliot Lake, Ontario, in the Southern Geologic province. The rocks retain a stable remanence acquired during diagenesis some 2.29 billion years ago. The calculated paleolatitude of 62 degrees favors a polar glacial till mode of deposition for the thick tillite members, rather than a subpolar periglacial dropstone mode. The Gowganda pole at lat 65 degrees N, long 123 degrees W indicates that either the ice cap was much larger than now thought or the Bear and Slave provinces were separated from the Churchill, Superior, and Southern provinces in Paleoaphebian time. The pole also requires a radical change in previously published Paleoaphebian polar wander paths. (Humphreys-ISWS)
W75-09763

2D. Evaporation and Transpiration

EVAPORATION FROM WATER SURFACES IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
J. D. Goodridge.
Bulletin 73-1, May 1974. 173 p, 3 tab, 12 ref, 2 plates.

Descriptors: *Evaporation, *Evaporation pans, *California, *Stations, Environment, Water policy, Management, Water resources, Irrigation water, Drainage, Conservation, Vegetation effects, Boundary layers, Wind velocity, Solar radiation, Planning, Arid climates, Data collections, Air-water interfaces, Free surfaces.
Identifiers: Upwind fetch.

Monthly total evaporation data were provided as reported by observers operating evaporation pans throughout California. It was the basic data appendix to Bulletin No. 73, 'Evaporation from Water Surfaces in California (1959).' It supplemented data in Bulletin 54-A, 'Evaporation from Water Surfaces in California; Basic Data (1948),' and reports in the Bulletin No. 113 series which dealt with vegetative water use and included considerable evaporation information on well-exposed Class A evaporation pans. Major drainage provinces, the hydrographic units lying within each, and the general geographic location of evaporation stations in the state were identified. Information on latitude, longitude, elevation, period of record, and pan environment for each station was given. Total evaporation data for each station was tabulated by months for each year within the period of record. A section on the nature of evaporation and factors affecting pan evaporation was included. (Roberts-ISWS)
W75-09586

AVERAGING ERRORS IN MONTHLY EVAPORATION ESTIMATES,
Alberta Univ., Edmonton. Dept. of Geography.
K. D. Hage.
Water Resources Research, Vol 11, No 2, p 359-361, April 1975. 2 tab, 6 ref.

Descriptors: *Evaporation, *Climatology, *Estimating, Temperature, Humidity, Environment, Wind velocity, Vapor pressure, Model studies, Hydrology, Heat flow, Latent heat, Weather, Data processing, Water temperature, Diffusion.
Identifiers: *Averaging errors, Dalton-type formula, Nonlinearity errors, Covariance, Taylor series, Clausius-Clapeyron equation, Biometeorology, Sensible heat flux.

The problem of computing evaporation from monthly mean values of temperature, relative humidity, and wind was considered with specific reference to a Dalton-type evaporation formula. Leading contributions due to nonlinearities, covariances, and their interactions were identified separately by expanding saturation vapor pressure as a Taylor series in temperature with the use of the Clausius-Clapeyron equation. A truncated form of the expansion was tested by using observations from a land station. A crude model of diurnal variations in air temperature, relative humidity, and wind speed was used to predict nonlinearity and covariance evaporation errors from monthly mean observations at 2 times per day. The model appeared to be accurate to within plus or minus 5% in warm seasons months but failed in winter when diurnal variability was negligible in comparison with air mass changes in weather elements at mid-latitude continental locations. Covariance and nonlinearity errors did not compensate each other in winter and averaging errors could reach 20-25%. (Roberts-ISWS)
W75-09590

WORLD MAPS OF POTENTIAL EVAPOTRANSPIRATION, PLANT DEVELOPMENT, AND SPRING GREENING AND AUTUMN BROWNING OF VEGETATION, BASED ON THE SOLAR THERMAL UNIT MODEL,
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
J. M. Caprio.
Research Report 60, June 1974. 26 p, 6 fig, 5 ref. NASA NAS 5-21781.

Descriptors: *Evapotranspiration, *Solar radiation, *Maps, Temperature, Plant growth, Vegetation, Alfalfa, Harvesting, Phenology, Atmosphere, Spring, Autumn, Lilac, Model studies.
Identifiers: *Potential evapotranspiration, *Solar thermal unit model, Green wave passage, Brown wave passage, Langley degree days.

It was suggested that the development of many plants, rate of potential evapotranspiration, vegetative greening in the spring (green wave), and possibly vegetative senescence in the autumn (brown wave) are associated largely with the solar radiation-atmospheric temperature interaction expressed as Solar Thermal Units (STU). These were defined as the product of the mean daily temperature in degrees Fahrenheit minus a threshold temperature of 31F times the daily total solar radiation on a horizontal surface (global radiation) in calories per square centimeter. A day with a mean temperature of 61F and total solar radiation of 500 calories per square centimeter would have 30 (i.e., 61F-31F) times 500 which equals 15,000 STU (Langley degree days). Six maps were presented based on the STU concept for about 300 locations throughout the world. Isolines tended to parallel latitudinal lines, but there was a tendency for the lines to extend northward in the western Pacific and western Atlantic areas because of the moderating effect of the warm Japanese and Gulf Currents in northern latitudes. Almost all of the high-producing agricultural areas of the world were shown to have average annual potential evapotranspiration of greater than 15 inches. (Roberts-ISWS)
W75-09771

TRANSPIRATION RATES OF CONIFERS,
Montana Univ., Missoula. Dept. of Botany.
M. J. Behan.
Montana University Joint Water Resources Research Center, Bozeman, Completion Report, February, 1974. 50 p, 6 tab, 3 photographs, 3 autoradiographs, 34 ref. OWRT A-015-MONT(1).

Descriptors: *Transpiration, *Douglas Fir trees, *Biorhythms, *Water conservation, *Conifers, Stomata, Water loss, Coniferous trees, Carbon dioxide, Diurnal, Humidity, Temperature, *Montana.

Research activities on the transpiration rates of confiers are summarized. A study of the fixation of C02 in the dark by Douglas Fir is described in detail. Dark C02 fixation and the accumulation of the C02 as organic acids was demonstrated by measurements of ph shifts, thin layer chromatography of needle extracts, and by treatment of seedlings with 14C02. The fixation of C02 in the dark has some advantages for plants growing under water stress as it allows them to fix carbon dioxide at a time when transpiration rates are reduced due to the increased humidity and cooler temperatures which generally occur at night. (Bowden-Arizona)
W75-09784

2E. Streamflow and Runoff

OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 4A.
W75-09594

COMPUTATION OF WAVE HEIGHTS DUE TO REFRACTION AND FRICTION,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-09606

COMPUTATION OF FLOW THROUGH MASONBORO INLET, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-09608

INITIAL BIFURCATION PROCESS IN NATURAL CHANNEL NETWORKS,
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 8B.
W75-09609

MAP SHOWING DRAINAGE AREAS, MARLBOROUGH QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09704

MAP SHOWING DRAINAGE AREAS, WEST SPRINGFIELD QUADRANGLE, MASSACHUSETTS-CONNECTICUT,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09705

MAP SHOWING DRAINAGE AREAS, LUDLOW QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09707

MAP SHOWING DRAINAGE AREAS, MOUNT TOM QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09708

TEMPERATURES OF STREAMS AND SELECTED RESERVOIRS IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-09713

A LABORATORY INVESTIGATION OF SURFACE RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Journal of Hydrology, Vol 25, No 3/4, p 187-200, May 1975. 7 fig, 4 tab, 19 ref.

Descriptors: *Surface runoff, *Hydrograph analysis, *Model studies, *Rainfall-runoff relationships, Prototypes, Research facilities, Hydrographs, Time series analysis, Unit hydrographs, Time lag, Hydrophase diagrams, Laboratory tests.
Identifiers: *Kinematic wave model, *Nash model, Converging surfaces.

A laboratory study of a kinematic wave model and Nash model was presented for a converging surface. The interdependent behavior of kinematic wave parameters was shown and based on this observation an experimental justification was given for retaining only one parameter in the kinematic wave model. It was observed that an objective function based on minimizing the sum of squares of hydrograph peak deviations is sufficiently adequate for fitting the entire hydrograph. An objective comparison of the two models demonstrated that the kinematic wave model is uniformly better than Nash model in performing hydrograph predictions on the laboratory watershed. (Jess-ISWS)
W75-09744

A NON-LINEAR RAINFALL-RUNOFF MODEL, PROVIDING FOR VARIABLE LAG TIME,
Newcastle-upon-Tyne Univ. (England). Dept. of Engineering Mathematics.
For primary bibliographic entry see Field 2A.
W75-09753

MAN-INDUCED CHANGES OF MIDDLE MISSISSIPPI RIVER,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W75-09754

THE COMPOSITE ROUGHNESS OF ICE COVERED STREAMS,
Iowa Inst. of Hydraulic Research, Iowa City.
For primary bibliographic entry see Field 2C.
W75-09758

STATISTICAL PROPERTIES OF WAVE FORCE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-09759

2F. Groundwater

GOUNDWATER MODELS,
R. G. Thomas.
Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 21, 1973. 192 p, 16 fig, 4 tab, 42 ref, 6 append.

Descriptors: *Model studies, *Computer models, *Mathematical models, *Hydrogeology, *Groundwater, *Aquifer management, Hydrologic models, Digital computers, Analog models, Groundwater basins, Groundwater mining, Groundwater resources, Simulation analysis, Arid lands, *Reviews.

The various types of computer models used for groundwater studies are reviewed. Thy hydrogeologic and mathematical concepts needed to enable one to convert actual field data into a model are emphasized. The polygonal model technique, because of its flexibility in many practical groundwater conditions, is described in detail. Only brief reference is made to finite difference methods and to use of programs prepared for the analysis of electronic circuits. A review of present and potential uses of the groundwater model in water resources planning is also presented. Appended are the contents of other papers which enable one to prepare a mathematical model of a groundwater basin for the computer. The publication functions as a manual on the development of the use of the digital computer for groundwater models and on how to prepare any Fortran program for any selected groundwater basin. (Bowden-Arizona)
W75-09582

GROUND-WATER LEVEL IN THE FLOOD PLAIN AND ADJACENT UPLANDS OF THE SANGAMON RIVER,
Illinois Univ., Urbana. Dept. of Forestry.
For primary bibliographic entry see Field 4B.
W75-09599

FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-09703

CONTOUR MAP OF THE BEDROCK SURFACE, COLLINSVILLE QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09706

GROUNDWATER LEVELS IN NEBRASKA, 1974,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W75-09710

GREAT LAKES BASIN FRAMEWORK STUDY: APPENDIX 3--GEOLOGY AND GROUND WATER,
Geological Survey, Albany, N.Y.
R. M. Waller, and W. B. Allen.
Great Lakes Basin Commission, Ann Arbor, Appendix 3 of Great Lakes Basin Framework Study, 1975. 152 p, 60 fig, 15 tab, 76 ref.

Descriptors: *Water resources, *Groundwater, *Great Lakes region, *Hydrogeology, Water quality, Water yield, Aquifers, Groundwater availability, Groundwater resources.
Identifiers: Great Lakes Basin.

The general geologic framework and groundwater situation throughout the Great Lakes Basin, major problems of quantity and chemical quality of groundwater, and factors to be considered in the conjunctive and beneficial use of the Basin's entire water resources are described. Emphasis is on major aquifer systems because domestic-type supplies are available almost everywhere. The Great Lakes Basin is underlain almost entirely by a thick succession of sedimentary rocks. Glacial and alluvial deposits cover the bedrock. These deposits are as much as 1,100 feet thick, with the thickest deposits generally occurring in Michigan and locally in buried bedrock velleys of New York and Wisconsin. Groundwater is present everywhere throughout the Basin, but in limited quantities in areas where the basement rock is at or near the surface. The most productive aquifers, with well yields as much as 2,500 gpm, occur in unconsolidated, well-sorted sand and gravel deposits, especially where natural recharge from streams or precipitation can occur readily. Unconsolidated aquifers are most widespread in western and central Michigan, northeastern Indiana, and the western part of Wisconsin. Carbonate (limestone and dolomite) aquifers constitute the most common bedrock aquifers in the Basin. They occur along the northern and western shore of Lake Michigan, from Illinois to Cleveland, and along the southern shore of Lake Ontario. A thick sequence of productive sandstone units is present along the western and northern part of the Lake Michigan basin. Chemical quality of groundwater is generally good, although saline, mineralized, or brackish water is present in deep bedrock throughout the Basin, and at shallow depths in a few places. (Knapp-USGS)
W75-09714

SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1973,
Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 4B.
W75-09716

GEOLOGIC AND HYDROLOGIC FEATURES OF INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Reston, Va.
L. C. Dutcher, and W. R. Moyle, Jr.
Available from GPO, Washington, D.C. 20402, Price $3.75 (paper copy). Water-Supply Paper 2007, 1973. 30 p, 3 fig, 6 plate, 3 tab, 23 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Hydrologic data, *Hydrogeology, *California, Arid climates, Groundwater basins, Groundwater potential, Water quality, Chemical analysis, Water management(Applied), Planning, Water supply, Water yield, Water wells, Water resources development.
Identifiers: *Indian Wells Valley(Calif), *Mojave Desert.

Groundwater pumpage in Indian Wells Valley, virtually a closed basin in the Mojave Desert of southern California, has gradually increased since 1945 and in 1966 has exceeded the average annual water yield (perennial supply). This report summarizes the principal geologic and hydrologic parameters needed for a detailed quantitative study of the hydrology, including the future development of a groundwater basin model. The groundwater basin contains a single body of groundwater in alluvial deposits locally as much as 2,000 feet thick. The deposits consist mainly of sand and gravel but grade to silt and silty clay beneath the lower parts of the valley surface. Coefficients of transmissivity range from almost zero at the basin margins to about 300,000 gallons per day per foot in the central part of the valley. The maximum developable yield of Indian Wells Valley groundwater basin, under existing conditions, is estimated to be 10,000 acre-feet. The water of best quality occurs in the alluvial deposits of shallow to medium thickness in the western and northwestern parts of the valley and in the deep zones in the central and south-central part of the basin. The dissolved-solids content of the water there is generally less than 600 mg/litre. Water in the shallow deposits beneath the playa areas contains dissolved-solids of more than 1,000 mg/litre. (Woodard-USGS)
W75-09717

AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,
Geological Survey, Providence, R.I.
H. E. Johnston, and D. C. Dickerman.
Water-Resources Investigations 18-74, December 1974. 39 p, 13 fig, 1 plate, 7 tab, 30 ref.

Descriptors: *Groundwater resources, *Water yield, *Water quality, *Rhode Island, Aquifer characteristics, Well data, Water wells, Chemical analysis, Hydrologic data, Surface-groundwater relationships, Streamflow, Groundwater recharge, Hydrogeology, Groundwater movement.
Identifiers: *Branch River basin(RI), *Providence County(RI).

In the Branch River basin, Providence County, Rhode Island, stratified glacial drift consisting largely of sand and gravel constitutes the only aquifer capable of supporting continuous yields of 100 gpm or more to individual wells. The aquifer covers about a third of the 79 sq mi study area, occurring mainly in stream valleys that are less than a mile wide. Its saturated thickness is commonly 40 to 60 ft; its transmissivity is commonly 5,000 to 8,000 sq ft/day. Potential sustained yield from most parts of the aquifer is limited chiefly by the rate at which infiltration can be induced from streams. If large-scale development of groundwater is not carefully managed, periods of no streamflow may result during dry weather. Potential sustained yield varies with the scheme of well development, and is evaluated for selected areas by mathematically simulating pumping from assumed schemes of wells in models of the stream-aquifer system. Results indicate that sustained yields of 5.5, 3.4, 1.6, and 1.3 mgd can be obtained from the stratified-drift aquifer near Slatersville, Oakland, Harrisville, and Chepachet, respectively. A larger groundwater yield can be obtained, if periods of no streamflow along reaches of principal streams are acceptable. Quality of water in the stream-aquifer system is suitable for most purposes; the water is soft, slightly acidic, and generally contains less than 100 mg per litre of dissolved solids. (Woodard-USGS)
W75-09721

HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
M. A. Crist.
Water-Resources Investigations 3-75, March 1975. 60 p, 11 fig, 4 plate, 11 tab, 25 ref.

Descriptors: *Irrigation wells, *Aquifer characteristics, *Hydrologic budget, *Model studies, *Wyoming, Digital computers, Forecasting, Water wells, Pumping, Water yield, Groundwater recharge, Surface-groundwater relationships, Water balance, Hydrologic data, Observation wells.
Identifiers: *Goshen County(Wyo).

The North Platte River valley in Goshen County, Wyo., is a highly productive agricultural area where most crops are irrigated principally with surface water. More than 200 irrigation wells in the valley fill are pumped for supplemental irrigation supplies. Groundwater in storage in the valley fill is estimated to be about 1,700,000 acre-feet. Recharge to groundwater from precipitation and imported irrigation water amounted to about 73,000 acre-feet and is nearly equal to the 76,000 acre-feet estimated as the amount of groundwater contributed to the North Platte River during the 1-year study. The hydrologic system of the valley fill is simulated with a digital model. Monthly net head change in the aquifer and the monthly net change in the groundwater discharge to the North Platte River was used to calibrate the model. The digital model developed during this investigation can be used to predict the effect of change in stress that might be applied to the system. (Woodard-USGS)
W75-09722

GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W75-09727

WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-09729

NUMERICAL ANALYSIS OF CONFINED-UNCONFINED AQUIFERS,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. M. Tomlinson.
Journal of Hydrology, Vol 25, No 3/4, p 259-274, May 1975. 8 fig, 4 tab, 10 ref.

Descriptors: *Numerical analysis, *Aquifers, *Interfaces, Groundwater recharge, Pumping, Equations, Hydraulic gradient, Digital computers, Analog models, Finite element analysis.
Identifiers: *Lincolnshire Limestone(England), Alternating direction method, Central difference approximation, Backward difference approximation, Iterative methods, Initial conditions, One-dimensional analysis, Two-dimensional analysis, Errors, Time steps, Mesh spacing, Convergence, Response time.

An aquifer which is partly confined and partly unconfined, presents particular difficulties when studied by numerical methods on a digital computer. By considering a one-dimensional example for which analytical solutions were available, it was found that central difference methods, such as the alternating direction method, are unsatisfactory, whereas backward difference methods give reliable results. An examination of a complex two-dimensional problem provided information about the size of time steps, convergence parameters, and the number of iterations required. (Visocky-ISWS)
W75-09751

HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,
Alberta Research, Edmonton.
G. F. Ozoray.
Report 74-2, 1974. 18 p, 1 fig, 70 ref.

Descriptors: *Hydrogeology, *Canada, *Groundwater movement, Safe yield, Aquifer characteristics, Water table, Muskeg, Springs, Mineral water, Perched water, Well data, Test wells, Geochemistry, Permafrost, Discharge(Water), Transmissivity.
Identifiers: *Alberta, Quasi-spring, Climafrost.

The hydrogeology of the uppermost 1000 feet of strata in the Waterways and Winefred Lake areas was described. Maps and profiles were constructed from limited existing data and from data collected by field survey and drilling operations. The 20-year safe yields are mostly over 5 imperial gallons per minute (igpm), reaching 25-100 igpm for over half of the map area. These yields are available within 500 feet of the surface. A practical limiting factor on groundwater use is quality, because deeper groundwater is saline. In many places, saline water discharges to the surface. A semidiffuse groundwater discharge feature ('quasi-spring') describes sources of creeks at definite spring-like points in groundwater-fed muskegs. The quasi-springs are climatically and topographically controlled discharge features of climafrost zones. Widespread muskeg development exists in the area and degeneration of the groundwater flow-systems is noted. (Visocky-ISWS)
W75-09769

2G. Water In Soils

INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS, LAS VEGAS, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2J.
W75-09374

PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-09423

EDAPHIC MICRO-TUBULAR CONTINUOUS FLOW IRRIGATION IN CANADA,
Department of Agriculture, Summerland (British Columbia).
D. S. Stevenson, and R. S. Tait.
In: Proceedings of the Second International Drip Irrigation Congress, p 86-90 (1974). 3 fig, 4 tab.

Descriptors: *Soil water movement, *Canada, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Microtubing.

A soil's ability to transfer water horizontally relative to vertical drainage is its most important characteristic in trickle irrigation. Water applied to a soil at a single point will move laterally and vertically. The shape of the resulting half sphere will depend upon the ratio of saturated conductivity to unsaturated conductivity of any particular soil. The limit to horizontal movement before drainage becomes excessive determines that area that can be irrigated with one dripper. Rooting depth of the crop imposes a limit to the area over which water will spread before an excess of it becomes drainage. Evapotranspiration (ET) over the area so defined thus determines the continuous flow from the dripper. Areas and ET are easily equated to provide dripper flows in g.p.h. The areas provide the dripper spacing for uniform irrigation. Microtubing of varying sizes and lengths as emitters provides flow control at the emitters for both level and sloping land. Seasonal changes in irrigation requirements (ET) are satisfied by alterations in line pressures as needed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09436

LINEARIZED MOISTURE FLOW SOLUTIONS FOR POINT, LINE, AND STRIP SOURCES,
Arizona Univ., Tucson.
A. W. Warrick, and D. O. Lomen.
In: Proceedings of the Second International Drip Irrigation Congress, p 228-233, (1974). 3 fig, 1 tab, 12 ref.

Descriptors: *Soil water movement, Mathematical studies, Irrigation system, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Point sources, Line sources, Strip sources.

Solutions and numerical results are given for the time-dependent, linearized moisture flow equation for point, line and strip sources. The linear form is attained by assuming an unsaturated hydraulic conductivity of the form K = ko exp (alpha h) with Ko and alpha constants and with h the pressure head. In addition, the derivative of K with respect to the volumetric water content is taken as a constant. Numerical results include: (1) spatial distribution of the matric flux potential for 6 times including a comparison of 2 flow rates for a point source; (2) pressure head distribution near a single point source under cyclic conditions; (3) pressure head distribution for 2 point sources under cyclic conditions, and (4) moisture distribution patterns near line and strip sources. The major advantage of using the linearized forms is that solutions for simplified geometries may be superimposed both in time and space to simulate complex geometries and inputs of water. The major disadvantage of the non-linear nature of the soil-hydraulic functions is lost. For cyclic moisture regimes at a high frequency, it is assumed the water content fluctuation of any point will be relatively small and the linearizing assumptions are realistic. (See also W75-09423) (Skogerboe-Colorado State)
W75-09459

TRICKLE IRRIGATION DESIGN FOR OPTIMAL SOIL WETTING,
Utah State Univ., Logan.
J. Keller, and D. Karmeli.
In: Proceedings of the Second International Drip Irrigation Congress, p 240-245, (1974). 2 fig, 2 tab, 3 ref.

Descriptors: *Irrigation design, Soil moisture, Evapotranspiration, Flow rates, Design criteria, Economics, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

The general relationship between the percentage area wetted and crop productivity is discussed and the recommended trickler spacing for achieving the desired soil wetting is presented. The number of operating blocks (stations or sub-units) required to obtain the desired soil wetting is developed considering ET demands and system capacity constraints. The effect of the number of blocks on hydraulic features of the network and the relative economic effect is considered. (See also W75-09423)
W75-09461

SOIL MOISTURE DISTRIBUTION AND WETTING PATTERN FROM A POINT SOURCE,
Arizona Univ., Yuma.
R. L. Roth.
In: Proceedings of the Second International Drip Irrigation Congress, p 246-251, (1974). 4 fig.

Descriptors: Wetting, *Water levels, Flow rates, *Soil water, Irrigation, Irrigation systems, Agriculture, *Soil moisture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Wetting patterns, Point source.

Soil moisture distribution and wetting pattern tests were conducted using a point source of virgin desert sandy soil. The purpose of these studies was to characterize the extent of moisture movement and distribution within the wetted volume. The flow rates tested were approximately 3.8, 7.6, and 15.2 liters per hour (1, 2, and 4 gph) for durations of 1, 3, 6, 12, 24, and 48 hours. At the completion of each test, a pit was dug which exposed the maximum vertical diametral plane of the wetted volume. Measurements were made to define the maximum wetted area. Soil moisture measurements were made at each node point of a 15.2-centimeter (6-inch) grid imposed on the maximum wetted area. Soil cores were taken at 15.2-centimeter intervals along the line of maximum horizontal water movement. These cores were used to determine bulk density, soil texture, permeability, and moisture release characteristics. A complete soil profile description was also made of each test site. For the tests conducted the total volume of soil wetted was more a function of the amount of water applied than time of application. Maximum horizontal movement was greater than maximum vertical movement for volumes of water less than 190 liters (50 gallons). Greater maximum vertical movement occurred at volumes of water more than 190 liters. Water within the wetted volume was determined to be at tensions between 100-140 centimeters of water. (See also W75-09423) (Skogerboe-Colorado State)
W75-09462

SOIL MOISTURE DISTRIBUTION AND DEPLETION IN AN APPLE ORCHARD IRRIGATED BY TRICKLERS,
Hebrew Univ., Rehovoth (Israel).
I. Levin, R. Assaf, and B. Bravo.
In: Proceedings of the Second International Drip Irrigation Congress, p 252-257, (1974). 4 fig, 1 tab, 4 ref.

Descriptors: *Irrigation practices, *Soil water movement, Irrigation systems, Frequency, Orchard, Apples, Crop response, Irrigation, Agriculture, *Soil moisture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Four treatments of trickle irrigation methods were applied in an apple orchard on heavy soil. The treatments differed in water discharge rate of the tricklers (4 and 8 liter/hour), distances between the outlets on the lateral lines (1.25 m and 2 m) and irrigation frequency (1, 3 and 7-day intervals). In all treatments the amount of water applied was on the basis of 10 mm/day consumptive use. Soil moisture content fluctuations in the upper 60 cm layer before, during and after irrigation were frequently measured. The distance wetted from the trickler was linearly dependent on the duration of the single irrigation and the discharge rate of the trickler: 65 cm, 80 cm, and 120 cm after 14, 24 and 70 hours of irrigation at a 4 liter/hour discharge rate, respectively; and 120 cm after 40 hours at a 8 liter/hour discharge rate. The soil moisture content at the end of the irrigation dropped gradually from under the trickler to the farthest distance wetted, where about 90% of field capacity was reached. After the termination of the irrigation, the soil moisture content depleted gradually to the level before the beginning of the irrigation - at all distances from the tricklers and in all treatments. The results indicate that there was deep drainage below the root zone in the area under the tricklers in all treatments. (See also W75-09423) (Skogerboe-Colorado State)
W75-09463

RECHARGE SIMULATION MODEL,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-09518

MOVEMENT OF POLLUTANT PHOSPHORUS IN UNSATURATED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-09527

URBAN LAWN INFILTRATION RATES AND FERTILIZER RUNOFF LOSSES UNDER SIMULATED RAINFALL,
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
For primary bibliographic entry see Field 5B.
W75-09592

IMPROVING THE DESIGN OF PRACTICAL FIELD DRAINAGE,
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
For primary bibliographic entry see Field 4A.
W75-09595

WAVE INDUCED PRESSURES IN PERMEABLE SEABEDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 8B.
W75-09607

SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS USING THE METHOD OF CHARACTERISTICS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
A. G. Smajstrla, D. L. Reddel, and E. A. Hiler.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 2, p 281-287, March-April 1975. 9 fig, 27 ref, 1 append.

Descriptors: *Simulation analysis, *Mathematical models, *Porous media, *Infiltration, *Soils, Computer programs, Model studies, Management, Darcys law, Dispersion, Saturated flow, Unsaturated flow, Solutes, Saturated soils, Moisture content, Homogeneity, Steady flow, Unsteady flow, Percolation, Isotropy, Ion transport.
Identifiers: *Vertical infiltration.

A simulation model was developed to simulate miscible displacement of a conservative solute during one-dimensional vertical infiltration into a homogeneous, isotropic, porous media. Solutions of transient flow problems were obtainable as well as steady state problems because it was not necessary to assume constant solution fluxes to solve the dispersion equation. The accuracy of the simulation model was tested by comparison with analytical solutions, experimental data, and other simulation results from the literature. Comparisons provided excellent agreement in all cases except for Warrick's field experimental data. Considering the nonhomogeneous field conditions encountered in Warrick's experimental plot, the simulated results were considered to be good. (Sanderson-ISWS)

W75-09612

FOR IMPROVING WATER PENETRATION INTO SOME ARIZONA SOILS-SULFURIC ACID,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W75-09623

SOIL MOISTURE SENSING SYSTEM,
C. Matlin.
US Patent No 3,882,383, 4 p, 9 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 382, May 6, 1975.

Descriptors: *Patents, *Soil moisture, Moisture content, Soil pressure, Electrical resistance, Electrodes, Equipment, *Instrumentation.

The invention relates to an electrical resistivity method for testing the moisture content of soil. The electrical resistivity of the soil is sensed by a soil moisture sensor having two electrodes in direct contact with the soil under test. This combination of sensor and associated soil become a variable resistive component of an electronic network whose output is used to energize either a meter for quantitative measurements or a miniature lite bulb for qualitative monitoring. The soil moisture sensor features a floating/breathing electrode to compensate for the adverse effects of unpredictable variations in contact pressure between the sensor electrodes and associated soil. The electrical circuitry features a means for depolarizing sensor electrodes; a means for assuring against electrical ground loops; and a solid state circuit for translating soil moisture into the light intensity of a miniature lite bulb. (Sinha-OEIS)
W75-09651

CONTOUR MAP OF THE BEDROCK SURFACE, COLLINSVILLE QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09706

PORE AND ERODING FLUID INFLUENCES ON SURFACE EROSION OF SOIL,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-09741

EFFECTS OF DEFORESTATION ON SLOPES,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-09743

A LABORATORY RAINFALL SIMULATOR FOR INFILTRATION AND SOIL DETACHMENT STUDIES,
Agricultural Research Service, Lafayette, Ind.
M. J. M. Romkens, L. F. Glenn, D. W. Nelson, and C. B. Roth.
Soil Science Society of America Proceedings, Vol 39, No 1, p 158-160, January-February 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Rainfall simulators, *Simulated rainfall, *Infiltration, *Soil erosion, Soil physics, Laboratory equipment, Soil physical properties, Research facilities, Equipment, Simulation analysis, Impact(Rainfall), Raindrops.

A laboratory rainfall simulator with high intensity precision and nearly uniform rain distribution was developed for studying rain infiltration into soils and soil detachability by rainfall. The rainfall simulator consists of an assembly of closely packed hypodermic syringes with plungers driven by a common plate. Rainfall intensity is determined by controlling the plunger speed at variable motor speeds. Rain is distributed uniformly by superpositioning three independent motions-rotation, and perpendicular and linear motions in the horizontal plane. Rainfall intensities were generally within 2.5% of predicted values. The average coefficient of variation of rain distribution for various rainfall intensities over a 100 sq cm area was reduced from 31.9% with no motion to 8.5% with rotation and linear motions. (Sims-ISWS)
W75-09746

MIX GYPSUM IN SHALLOW DEPTHS--IN SALINE SOILS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 3C.
W75-09786

HUNGRY DRYLANDS OF WESTERN RAJASTHAN NEED A NEW TECHNOLOGY,
Central Arid Zone Research Inst. Jodhpur (India). Dry Farming Research Main Centre.
For primary bibliographic entry see Field 3F.
W75-09789

FLOW-ASSOCIATED PRECIPITATION REACTIONS IN SALINE-SODIC SOILS AND THEIR SIGNIFICANCE,
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and I. S. Dahiya.
Geoderma, Vol 11, No 4, p 305-312, July 1974. 3 fig, 2 tab, 5 ref.

Descriptors: *Saline soils, *Land reclamation, *Gypsum, *Chemical precipitation, *Arid climates, Carbonates, Sodium, Calcium, Leaching, Soil amendments, Infiltration, Flow rates, Leachate, Saturation.

Reclamation of saline-sodic soils requires that excess exchangeable sodium on the clay complex be replaced by the more favorable divalent calcium ion and that excess soluble salts present in the soil also be leached from the root zone. The effect of flow rate and concentration of calcium the leaching solution on the extent of carbonate precipitation was studied on a highly saline-sodic soil. Precipitation of soluble carbonates in the soil increased with increasing flow velocity and concentration of calcium in the leaching solution. These results are discussed in terms of actual flow processes at the wetting front. The results suggest that by controlling the extent of carbonate precipitation, the quantity of soil amendments containing calcium necessary for reclamation of sodic soils rich in soluble carbonates can be reduced considerably. In many cases the amount of gypsum required by these soils is often overestimated because a large portion of the soluble carbonates is leached out without reaction with the added gypsum. (Mastic-Arizona)
W75-09792

IN SALT-AFFECTED SOILS MULCHING AIDS IN CROP GROWTH,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 3C.
W75-09798

INDIA CASE STUDY ON IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS.
Food and Agricultural Organization of the United Nations, Rome (Italy). Committee on Agriculture.
For primary bibliographic entry see Field 3F.
W75-09803

2H. Lakes

SILT REMOVAL FROM A LAKE BOTTOM.
Lake Herman Development Association, Inc., Madison, S. Dak.
For primary bibliographic entry see Field 5C.
W75-09575

WATER QUALITY EFFECT OF DIKING A SHALLOW ARID-REGION LAKE,
Brigham Young Univ., Provo, Utah.
For primary bibliographic entry see Field 5B.
W75-09577

EFFECTS OF SALINE WATER FROM NORTH DAKOTA LAKES ON SURVIVAL OF FATHEAD MINNOW (PIMEPHALES PROMELAS) EMBRYOS AND SAC FRY,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-09669

DYNAMICS OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2J.
W75-09709

THE PREDICTION OF LAKE HURON LAKE-EFFECT SNOWFALL SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-09748

A SALINE INTRUSION INTO SENECA LAKE, NEW YORK,
Hobart and William Smith Colleges, Geneva, N.Y. Earth and Space Sciences Program.
For primary bibliographic entry see Field 5B.
W75-09765

2I. Water In Plants

EFFECT OF ROOT TEMPERATURE AND HUMIDITY ON THE DISTRIBUTION OF CA IN APPLE AND SUNFLOWER SEEDLINGS,
Washington State Univ., Pullman. Dept. of Horticulture.
C. G. Woodbridge.
Z Pflanzenernaehr Bodenkd, Vol 133, No 1/2, p 64-69, 1972.

Descriptors: *Calcium, *Apples, Seedlings, Temperature, Humidity, Distribution, *Root systems.
Identifiers: *Sunflower.

Using 45Ca, the effects of root temperature and relative humidity on Ca distribution in apple and sunflower seedlings were studied during a 24 h experimental period. At 5C Ca accumulation in apple stems and leaves was much less than at 15C, 20C, 30C and 40C. The ratio of Ca accumulation in the stems and leaves was constant Maximum translocation occurred when root temperature was between 15 and 30C. In sunflower stems there was less accumulation of Ca at 5C and 40C than at other temperatures. In the basal leaves and tops more Ca accumulated at 20C and 30C than at 5C, 15C or 40C. The ratio between Ca accumulation in the basal leaves or tops and that in the stems varied with temperature. In apple seedlings less Ca was translocated than in the sunflower seedlings at all temperatures. The effects of humidity, 40% and 90%, on translocation were small.--Copyright 1974, Biological Abstracts, Inc.
W75-09351

DROUGHT CRACK ON WESTERN WHITE PINE IN NORTHERN IDAHO,
Forest Service (USDA), Moscow, Idaho. Intermountain Forest and Range Experiment Station.
R. D. Hungerford.
For Sci, Vol 19, No 1, p 77-80, 1973, Illus.

Descriptors: *Idaho, *White pine trees, *Droughts, *Moisture stress, Moisture deficit, Trees.
Identifiers: Tree cracks.

In Sept. of 1967 1 western white pine (Pinus monticola) in Northern Idaho had external cracks which were not apparent 3 mo. earlier. This fact together with observation of climatic data, site conditions, and wood anatomy suggest that cracking resulted from moisture stress. Inherent structural weaknesses of the wood apparently predisposed the tree stem to cracking during the drought.--Copyright 1973, Biological Abstracts, Inc.
W75-09388

PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-09423

SEE GERMINATION RESPONSE TO SUBSURFACE IRRIGATION DEPTH,
Agricultural Research Service, Brawley, Calif.
L. S. Willardson.
In: Proceedings of the Second International Drip Irrigation Congress, p 178-182, (1974). 4 fig, 2 ref.

Descriptors: *Subsurface irrigation, *Cotton, *Alfalfa, *Germination, Crop response, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Line sources.

A line source subsurface irrigation system was installed at 0, 2.54, 5.08, 10.16, and 20.32 cm depths in a sandy silt soil. The electrical conductivity of the soil varied between 10.4 and 16.2 mmhos per cm. Cotton and alfalfa were used to determine the effect of depth of placement of the seeds and water source on germination. (See also W75-09423) (Skogerboe-Colorado State)
W75-09451

CHANGES IN ROOT PATTERNS OF PEACH TREES UNDER TRICKLE IRRIGATION,
Victoria Dept. of Agriculture (Australia).
P. Willoughby, and B. Cockroft.
In: Proceedings of the Second International Drip Irrigation Congress, p 439-442, (1974). 3 tab.

Descriptors: *Peaches, *Root development, *Root distribution, *Root systems, Crop response, Irrigation effects, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

With fully mature peach trees, which before the installation of a trickle system had a uniformly distributed root system through the whole orchard area, the change to trickle produced a remarkable adaption by the tree. A whole new root system was developed in a few months, and the trees continued to produce heavy crops of fruit. (See also W75-09423) (Skogerboe-Colorado State)
W75-09498

EFFECTS OF DRIP IRRIGATION ON SOIL-WATER-PLANT RELATIONSHIP,
Sao Paulo Univ. (Brazil). Escola Superior de Agricultura Luiz de Queiroz.
H. A. Manfrinato.
In: Proceedings of the Second International Drip Irrigation Congress, p 446-451, (1974). 1 fig, 4 tab, 9 ref.

Descriptors: *Infiltration, *Moisture content, *Soil water movement, *Soil-water-plant relationships, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Soil columns.

Soil columns, prepared in the laboratory, by packing sieved and air dried soil into cylinder tubes were used to study the distribution of moisture content at the moment of infiltration. Drops of water, were applied simulating rain, at eight different intensities, called treatments, with two repetitions. When the water application rate was continually reduced throughout the treatments, the moisture content also diminished and vice versa. It was also concluded that when the rain application intensity was decreasing to a very small rate, the moisture content had such a slow reduction, as if going to a limit, which was found to be the soil field capacity. (See also W75-09423) (Skogerboe-Colorado State)
W75-09500

THE RELATION BETWEEN DRIP IRRIGATION, PHYTOPHTHORA ROOT ROT OF AVOCADO, AND FUNGICIDES,
California Univ., Riverside.
G. A. Zentmyer, F. B. Guillement, and E. L. V. Johnson.
In: Proceedings of the Second International Drip Irrigation Congress, p 512-514, (1974).

Descriptors: *Diseases, *Disease resistance, *Fungicides, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Avocado.

Studies have been initiated to determine the effect of drip irrigation on development, spread and control of Phytophthora root rot of avocado caused by Phytophthora cinnamomi. In one test in naturally infested soil, development of Phytophthora root rot of avocado seedlings was considerably slower under drip than under sprinkler irrigation. There were also indications of less rapid spread of the fungus from infested into noninfested soil under the drip, as compared with the sprinkler regime. At the end of the first year of the experiment, 6 of 12 seedlings were still healthy in soil infested with P. cinnamomi when irrigated with a drip system, compared with 2 healthy seedlings of 12 irrigated with spitters. A number of soil fungicides have been tested in the greenhouse for possible use in drip systems, by applying frequent applications (every other day or every fourth day) to avocado seedlings growing in soil infested with Phytophthora cinnamomi. The best control of the disease has been obtained with ethazol (5-ethoxy-3-trichloremethyl-1, 2, 4-thiadiazole) chemicals for incorporation in drip systems is still in the early stages. One field plot has been established with Terrazole applied in a drip system to 10-year old avocado trees with Phytophthora root rot, and also to young trees replanted in infested soil. (See also W75-09423) (Skogerboe-Colorado State)
W75-09512

BIOPHYSICAL CONTROL OF WATER LOSS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W75-09523

WORLD MAPS OF POTENTIAL EVAPOTRANSPIRATION, PLANT DEVELOPMENT, AND SPRING GREENING AND AUTUMN BROWNING OF VEGETATION, BASED ON THE SOLAR THERMAL UNIT MODEL,
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2D.
W75-09771

TRANSPIRATION RATES OF CONIFERS,
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 2D.
W75-09784

TRITIATED WATER TURNOVER RATE IN RODENTS: DESERT AND MOUNTAIN,
Nevada Univ., Reno. Desert Research Inst.
M. K. Yousef, H. D. Johnson, W. G. Bradley, and S. M. Seif.
Physiological Zoology, Vol 47, No 3, p 153-162, July, 1974. 5 fig, 3 tab, 20 ref.

Descriptors: *Rodents, *Water consumption, *Animal physiology, *Moisture stress, *Animal metabolism, Arid lands, Water utilization, Deserts, Respiration, Water requirements.
Identifiers: *Tritiated water turnover rate.

It has been technically difficult in the past to determine the daily water exchange between an animal and its surroundings. The use of tritiated water has proved useful for estimating water-turnover rate, k, where k represents the fraction of body-water pool turned over per unit of time. Assuming that animals are normally in a state of dynamic equilibrium, the measurement of k should equal daily water requirements. Eight species of rodents, three species each of kangaroo rats and ground squirrels and one species of wood rat and chipmunk, representing three families, were used in this study. These species are characteristic of a range of habitats from low desert to montane forest. The water turnover rate varied widely between the species. This difference in rate appears unrelated in most instances to phylogeny but is probably influenced by ecologic distribution, diet, behavior, and metabolic rate. (Bowden-Arizona)
W75-09801

2J. Erosion and Sedimentation

INFLUENCE OF SURFACE AND NEAR-SURFACE CALICHE DISTRIBUTION ON INFILTRATION CHARACTERISTICS, LAS VEGAS, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
R. L. Cooley, G. W. Fiero, Jr., L. H. Lattman, and A. L. Mindling.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 379, $4.25 in paper copy, $2.25 in microfiche. Center for Water Resources Research, Publication No 20, December 1974, 54 p, 14 fig, 6 tab, 10 ref. OWRT B-062-NEV(1). 14-31-0001-3910.

Descriptors: *Aprons, Artificial recharge, Engineering structures, Flood control, Runoff, *Nevada, *Caliche, *Distribution, *Infiltration, Sedimentation.
Identifiers: *McCullough Range(Nev).

Objectives were (1) to determine the distribution and infiltration characteristics of caliche on McCullough Fan, a large pedimented alluvial fan bordering the McCullough Range south of Las Vegas, Nevada and (2) to investigate the development of caliche on ephermeral stream channels and interfluves on the fan. Field study indicated that caliche development and distribution are related to three erosion surfaces and to three lithologic units. Underlying the uppermost erosion surface is a fine-grained petrocalcic horizon riddled with solution-widened fractures and which contains almost no coarse clastics. The middle caliche layer mainly contains boulders, cobbles and pebbles with a variable degree of cementation. The lower surface is made up of discontinuous calcic horizons and case-hardened banks. Caliche influences infiltration mainly as gully-bed cementation horizons in the medial and distal portions of the fan. Infiltration tests were conducted establishing that interconnected fractures in the vertical fractured caliche provide a direct avenue for infiltrated water to pass through, however, most precipitation does not pass through the upper sediments.

Bouldery caliche acts as a relatively impermeable barrier to route water laterally to exit points on the walls of deep gullies. (See also W73-10721) (Fallon-Nevada)
W75-09374

QUATERNARY SEDIMENTATION ON THE AMAZON CONTINENTAL MARGIN: A MODEL,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W75-09600

CHEMICAL TRANSPORT BY THE MEKONG RIVER,
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W75-09603

WAVE INDUCED PRESSURES IN PERMEABLE SEABEDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 8B.
W75-09607

INITIAL BIFURCATION PROCESS IN NATURAL CHANNEL NETWORKS,
New South Wales Univ., Kensington (Australia). School of Geography.
For primary bibliographic entry see Field 8B.
W75-09609

CHANNEL RESPONSES TO ARTIFICIAL STREAM CAPTURE, DEATH VALLEY, CALIFORNIA,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
D. Dzurisin.
Geology, Vol 3, No 2, p 309-312, June 1975. 4 fig, 5 ref.

Descriptors: *Channel erosion, *Channel morphology, *Streams, Erosion, Erosion rates, Deposition(Sediments), Headward erosion, *California, Streamflow, Sediments, Stream stabilization, Debris avalanches, Geomorphology, Ephemeral streams, Slopes, Profiles.
Identifiers: *Stream capture, *Channel adjustments, Vertical erosion, Death Valley(Calif).

Artificial capture of Furnace Creek Wash by Gower Gulch in 1941 caused channel responses in three separate reaches of this integrated ephemeral stream system: (1) upper Furnace Creek Wash, (2) Gower Gulch channel, and (3) Gower Gulch fan. At the diversion point, vertical erosion had lowered the brink of a 25-m nickpoint by approximately 3.2 m by 1974. Upstream from the nickpoint, Furnace Creek Wash had responded with headward dissection for 2.7 km and removal of debris at a mean rate of about 4000 cu m per year. The mean slope of the Gower Gulch channel had been lowered throughout by erosion due to drastically increased discharge, producing debris at a mean rate of about 2000 cu m per year. Dissection of the upper part of the Gower fan to a maximum depth of 5.7 m and production of debris at a mean rate of about 400 cu m per year are attributed to high stream velocities and increased discharge. In the absence of further intervention, evolution of the system during the next few hundred years is likely to be characterized by the following: (1) increasing depth and extent of headward dissection in Furnace Creek Wash and its tributaries upstream from the diversion point and (2) readjustment of the Gower fan profile in response to accumulation of coarse diverted debris. (Lee-ISWS)
W75-09610

THE EFFECT OF SULFATE AND MANGANESE DIOXIDE ON THE RELEASE OF PHOSPHORUS FROM LAKE MENDOTA SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W75-09619

DYNAMICS OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va.
E. J. Pluhowski.
Open-File report 75-249, May 1975. 59 p, 34 fig, 2 tab, 13 ref.

Descriptors: *Sediment transport, *Lake Ontario, *Aerial photography, *Turbidity currents, Tracers, Erosion, Inflow, Beach erosion, Littoral drift, Currents(Water), Remote sensing, Satellites(Artificial), Methodology, Tracking techniques, Data collections.
Identifiers: *Turbidity plume tracers.

Field activities and image analyses focused on the 275-kilometer-long south shore of Lake Ontario. LANDSAT-1 images were screened for large-scale turbidity features. Ground-truth measurements of temperature, turbidity, and several meteorologic parameters were obtained at selected sites along the south shore of the lake, at times coinciding with satellite overpasses. Large well-defined turbidity plumes were frequently observed at the mouths of the Niagara River, Welland Canal, Oswego River, and Genesee River. Although generally confirming the existence of a west-to-east littoral current along the south shore, notable exceptions to the prevailing direction were detected, especially in the Rochester embayment and in the vicinity of the Niagara River plume. Based on plume characteristics during the shipping season, the Welland Canal yields the highest concentrations of suspended matter to Lake Ontario along its south shore. Three high-risk beach-erosion zones were identified in the images, (1) Fifty Mile Pt., Ontario to Thirty Mile Pt., N.Y., (2) the Rochester embayment, and (3) Sodus Bay to Nine Mile Pt. (Woodard-USGS)
W75-09709

GEOLOGY OF GRIGGS AND STEELE COUNTIES,
Geological Survey, Grand Forks, N. Dak.
J. P. Bluemle.
Bulletin 64--Part 1, and North Dakota State Water Commission County Ground Water Studies 21--Part 1, 1975. 50 p, 29 fig, 2 plate, 2 tab, 27 ref.

Descriptors: *Geology, *Geologic formations, *Aquifers, *Sediment transport, *Geological surveys, *North Dakota, Geologic history, Glaciation, Lakes, Sedimentation, Geomorphology, Hydrogeology, Geologic mapping, Bedrock, Sands, Till, Mineralogy.
Identifiers: *Griggs and Steele Counties(N Dak).

The glacial deposits in Griggs and Steele Counties, N. Dak., are described in detail. This information should be of value to anyone interested in the distribution of the geologic units that have potential as aquifers. Griggs and Steele Counties, located at the eastern edge of the Williston basin, are underlain by 400 to 2,600 feet of Paleozoic and Mesozoic rocks that dip gently to the west. The Cretaceous Greenhorn, Carlile, Niobrara, and Pierre Formations lie directly beneath the glacial drift, and shale of the Pierre Formation is exposed in several places along the Sheyenne River. The Pleistocene Coleharbor Formation, which covers most of the area, consists mainly of glacial, fluvial, and lake sediment. The Coleharbor Formation averages 200 to 300 feet thick, but it is as much as 550 feet thick in some of the buried valleys. The Holocene Walsh Formation occurs in parts of the area, chiefly sloughs and river bottomland. It consists mainly of alluvial and eolian sediment. As the Late Wisconsinan glacier in eastern North Dakota thinned and receded eastward, large areas of Griggs County were washed by water flowing from the glacier. Continued withdrawal of the glacier resulted in ponding of melt water in parts of the two counties. These and other ponds tended to coalesce at lower and lower elevations, eventually forming Lake Agassiz, which flooded part of eastern Steele County. (Woodard-USGS)
W75-09725

SEDIMENT RESUSPENSION AND DEPOSITION IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W75-09736

PORE AND ERODING FLUID INFLUENCES ON SURFACE EROSION OF SOIL,
California Univ., Davis. Dept. of Civil Engineering.
K. Arulanandan, P. Loganathan, and R. B. Krone.
Journal of the Geotechnical Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No GT1, Paper 11078, p 51-66, January 1975. 16 fig, 3 tab, 18 ref, 2 append. NSF Grant GK40283.

Descriptors: *Erosion, *Pore pressure, *Soil erosion, *Shear stress, *Flocculation, Sodium, Soil structure, Clays.
Identifiers: *Fluid influences, *Critical shear stress, Geotechnical engineering, Deflocculating.

Hydraulic erosion studies were carried out with a modified rotating-cylinder apparatus on saturated Yolo loam soil at different pore fluid compositions. The critical shear stress required to initiate erosion was shown to be controlled by the structure of the soil as influenced by the pore fluid composition. The critical shear stress was also shown to be dependent on the composition of the eroding fluid. The structure of the soil and the osmotic influences caused by the differences in the electrolyte concentration of the pore and eroding fluids were considered to explain the mechanism of surface erosion. (Bhowmik-ISWS)
W75-09741

STREAM ORDERING AND CONTOUR MAPPING,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W75-09745

A LABORATORY RAINFALL SIMULATOR FOR INFILTRATION AND SOIL DETACHMENT STUDIES,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 2G.
W75-09746

SEDIMENT YIELDS FROM INTERMEDIATE-SIZED STREAM BASINS IN SOUTHERN ALBERTA,
Alberta Univ., Edmonton. Dept. of Geography.
H. J. McPherson.
Journal of Hydrology, Vol 25, No 3/4, p 243-257, May 1975. 4 fig, 4 tab, 12 ref.

Descriptors: *Sediment yield, *River basins, *Hydrologic data, *Canada, Suspended solids, Dissolved solids, Regression analysis, Sediment load, Geomorphology, Rivers, Hydrology, Sedimentation, Sediment transport, Sampling, Watersheds(Basins).
Identifiers: *Alberta.

Suspended sediment yields were determined for 36 basins and dissolved sediment yields were determined for 21 intermediate-sized stream basins in southern Alberta, Canada. Calculation of long-

term mean sediment loads was based on the establishment of sediment rating-curves for gaging stations at the basins outlets and the construction of a sediment duration curve from sediment rating and flow duration curves. Mean yearly suspended sediment export ranged from 12.55 tons/sq mi to 576.9 tons/sq mi with 58% of the basins yielding less than 200 tons/sq mi. These rates were in close agreement with values reported by others for western Canada. Dissolved sediment yields ranged from 0.89 to 286.6 tons/sq mi per year with 50% of the catchments contributing less than 50 tons/sq mi per year. Relationsips between sediment yields and geomorphic and hydrologic variables were subjected to regression analysis. Highly significant relationships were established between sediment yields, unit mean discharge, mean annual discharge, local relief, elevation, and mean land slope. Mean land slope and unit mean discharge were the variables which gave the highest correlation coefficients. Predictive equations were developed which allow sediment yields to be determined for ungaged catchments. (Adams-ISWS)
W75-09750

SEDIMENTS AND STRUCTURE OF THE JAPAN SEA,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
W. J. Ludwig, S. Murauchi, and R. E. Houtz.
Geological Society of America Bulletin, Vol 86, No 5, p 651-664, May 1975. 9 fig, 1 tab, 72 ref. ONR Contract N00014-67-A-0108-004, NSF Grant GA-27281.

Descriptors: *Sediments, *Seismic studies, Pacific coast region, Sediment distribution, Structural analysis, Marine geology, Oceans, Measurement.
Identifiers: *Seismic reflection, *Japan Sea, *Sonobuoys, Profiler, Marginal ocean basins, Abyssal plain, Yamato Basin, Sea floor, Seismic refraction.

Seismic reflection (profiler) traverses of the Japan Basin, Yamato Basin, and intervening Yamato Ridge reveal horizontally stratified sediments over weakly stratified sediments. Wide-angle reflection and refraction data from 65 sonobuoy stations made en route gave velocities in the sediments that range from 1.6 to 3.2 km/sec. The results of profiler-sonobuoy measurements combined with the results of earlier two-ship seismic refraction measurements indicated that the Japan Basin and Yamato Basin are underlain by oceanic crust which in turn is covered by sediments (and volcanics) that have built a shallower sea floor than that in the western North Pacific basin. Yamato Ridge appears to be mainly a pile of volcanics resting on an oceanic layer at normal depth. The crust of Yamato Basin may also have been modified to the extent that it has a thicker than normal layer 3 and a low-velocity mantle. Other profiler-sonobuoy data, gathered in the strait between Japan and Korea and across the Japan Sea margin of southwest Japan and northeast Japan, were presented. A number of profiler crossings of Toyama Channel indicated its formation by turbidity currents. Turbidity flows in this channel and in other channels transport sediment to the abyssal plain. (Lee-ISWS)
W75-09756

ADENOSINE TRIPHOSPHATE MEASUREMENTS IN SOIL AND MARINE SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-09764

WATER ESCAPE STRUCTURES IN COARSE-GRAINED SEDIMENTS,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
D. R. Lowe.
Sedimentology, Vol 22, No 2, p 157-204, May 1975. 20 fig, 107 ref.

Descriptors: *Sedimentary structures, *Consolidation, *Pore water, Sediments, Fluid friction, Bearing strength, Deformation, Stress, Particle size, Permeability, Sands, Silts, Gravels, Seepage, Earthquakes, Sedimentation rates, Deposition(Sediments).
Identifiers: *Water escape, *Liquefaction, *Fluidization, Packing, Cross bedding.

Three processes of water escape characterize the consolidation of silt-, sand-, and gravel-sized sediments: seepage, liquefaction, and fluidization. Four main types of water escape structures form during the fluidization and liquefaction of sands: (1) soft-sediment mixing bodies, (2) soft-sediment intrusions, (3) consolidation laminations, and (4) soft-sediment folds. These structures represent both the direct rearrangement of sediment grains by escaping fluids and the deformation of hydroplastic, liquefied, or fluidized sediment in response to external stresses. Fundamental controls on sediment consolidation are exerted by the bulk sediment properties of grain size, packing, permeability, and strength, and by external disturbances which act to trigger liquefaction and fluidization. The liquefaction and fluidization of natural sands usually accompany the collapse of loosely packed cross-bedded deposits. Water escape structures most commonly form in fine- to medium-grained sands deposited at high sedimentation rates and are particularly abundant in cross-laminated deposits. Their development is favored by upward decreasing permeability within sedimentary units. They are especially common in sequences made of alternating fine- and coarse-grained units such as deep-sea flysch, prodelta, and, to a lesser extent, fluvial point bar, levee, and proximal overbank deposits. (Visocky-ISWS)
W75-09768

PROPOSED MAINTENANCE DREDGING OF THE CHANNEL FROM U.S. COAST GUARD SANTA ROSA STATION MOORINGS TO NAVIGABLE WATERSHED IN PENSACOLA BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard District (8th), New Orleans, La.
For primary bibliographic entry see Field 8A.
W75-09824

2K. Chemical Processes

DETERMINATION OF LEAD IN POTABLE WATERS USING DELVES CUP ATOMIC ABSORPTION SPECTROMETER WITH SIGNAL INTEGRATION,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
For primary bibliographic entry see Field 5A.
W75-09366

WATER ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W75-09372

CHEMICAL TRANSPORT BY THE MEKONG RIVER,
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W75-09603

SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS USING THE METHOD OF CHARACTERISTICS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-09612

EFFECTS OF METAL-MINE DRAINAGE ON WATER QUALITY IN SELECTED AREAS OF COLORADO, 1972-73,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5C.
W75-09712

GREAT LAKES BASIN FRAMEWORK STUDY: APPENDIX 3--GEOLOGY AND GROUND WATER,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2F.
W75-09714

GEOLOGIC AND HYDROLOGIC FEATURES OF INDIAN WELLS VALLEY, CALIFORNIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-09717

CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5B.
W75-09719

AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,
Geological Survey, Providence, R.I.
For primary bibliographic entry see Field 2F.
W75-09721

AUTOMATION IN A WATER QUALITY LABORATORY SCHEME,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-09723

GEOCHEMISTRY APPLIED TO THE DISCOVERY, EVALUATION, AND EXPLOITATION OF GEOTHERMAL ENERGY RESOURCES,
Geological Survey, Menlo Park, Calif.
D. E. White.
In: Proceedings of the United Nations Symposium on the Development and Utilization of Geothermal Resources, September 22-October 1, 1970, Pisa, Italy: Geothermics, Special Issue 2, Vol 1, p 58-80, Instituto Internazionale per le Recerche Geotermiche, 1974. 3 fig, 4 tab, 106 ref.

Descriptors: *Geothermal studies, *Geochemistry, Water chemistry, Thermal water, Leaching, Water sources.

The application of geochemistry to geothermal energy resources requires an understanding of the sources of fluid constituents and a recognition of the major types of geothermal systems. For geochemical and most other purposes, the fundamental basis for classifying these systems is the physical state of the continuous fluid phase, whether liquid or vapor. The two contrasting types are called hot-water and vapor-dominated. The geochemical behavior of substances of high and low volatility obviously must differ greatly, depending on the physical state of the dominant fluid. Many constituents are useful in evaluating the hot-water systems, but only a few volatile constituents are significant to the vapor-dominated systems. The water that recharges most geothermal systems is, in overwhelming proportions, the local dominant meteoric water of each area. The chemical composition of thermal waters may be dominated by water-rock reactions, or constituents already dissolved in water of any type may be added to a system of convecting meteoric water. Concentrations of the major rock-forming elements in waters are controlled largely by temperature-dependent reactions. (Knapp-USGS)

W75-09724

GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W75-09727

WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-09729

AUTOMATIC U.V.-CONTROL SYSTEM FOR RELATIVE EVALUATION OF ORGANIC WATER POLLUTION,
Vyzkumny Ustav Vodohospodarsky, Ostrava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W75-09735

HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-09769

FLOW-ASSOCIATED PRECIPITATION REACTIONS IN SALINE-SODIC SOILS AND THEIR SIGNIFICANCE,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W75-09792

2L. Estuaries

WAVE FORCE COEFFICIENTS FOR CIRCULAR PIERS,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W75-09593

QUATERNARY SEDIMENTATION ON THE AMAZON CONTINENTAL MARGIN: A MODEL,
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman, C. P. Summerhayes, and H. T. Barretto.
Geological Society of America Bulletin, Vol 86, No 5, p 610-614, May 1975. 5 fig, 26 ref. NSF GX-41960.

Descriptors: *Sediment transport, *Sediment distribution, *Shores, Sedimentation, Sediments, South America, Estuaries, Coastal plains, Quaternary period, Model studies, Sea level.
Identifiers: *Nearshore sedimentation, *Amazon River sediments, *Amazon River, Nearshore environment, River mouth, Deep-sea sediment.

Sedimentation on the Amazon continental margin occurred in two distinct patterns during the Quaternary Period. During interglacials, when sea level was high (as at present), most of the sediment contributed by the Amazon River was deposited near the river mouth, then transported northwest along the innnermost shelf by longshore currents. Apparently, little Amazon sediment escaped the nearshore environment. As sea level fell in response to glacial advance, the sedimentation pattern remained roughly similar, resulting in construction of an extensive prograding shoreline. Once the sea fell more than -60 to -80 m relative to present sea level, however, most Amazon sediment was channeled directly to the deep sea. Shoreline accretion stopped, but prograded sediments were preserved as a mud wedge that presently occupies the inner shelf seaward of the Amazon River. This model also explains the accumulation of large quantities of arkosic sands throughout the western Equatorial Atlantic deep sea during Pleistocene glacial epochs. These arkosic sediments appear to have been derived mostly from the Andes Mountains via the Amazon River. (Lee-ISWS)
W75-09600

INTERACTION BETWEEN THE DAILY HEAT BALANCE AND THE TIDAL CYCLE,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W75-09602

COMPUTATION OF WAVE HEIGHTS DUE TO REFRACTION AND FRICTION,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W75-09606

COMPUTATION OF FLOW THROUGH MASONBORO INLET, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
M. Amein.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW1, Proceedings Paper 11124, p 93-108, February 1975. 8 fig, 3 tab, 24 ref, 2 append. Grants 2-35178,04-3-158-40.

Descriptors: *Coastal engineering, *Inlets(Waterways), *Mathematical models, *Numerical analysis, *North Carolina, Simulation analysis, Flow rates, Currents(Water), Estuaries, Tides, Model studies, Unsteady flow.
Identifiers: *Masonboro Inlet(NC).

The Masonboro Inlet system is a complex arrangement of channels connecting the coastal waterways to the Atlantic Ocean. The flow through the system was computed by means of a numerical model based on the equations of unsteady flow which represent the laws for the conservation of mass and momentum. An implicit method was used to find the solutions for the finite difference equations. The method requires that the basic equations be satisfied at all locations simultaneously. A comparison of the computed results with the field observations demonstrated the accuracy, reliability, and efficiency of the method. It was proposed that the simulation model can handle other inlets with little difficulty, because other inlets are generally much simpler than the Masonboro Inlet. (Lee-ISWS)
W75-09608

A CASE STUDY OF ESTUARINE POLLUTION AND LOCAL AGENCY INTERACTIONS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 5G.
W75-09620

THE BOTTOM FAUNA OF CHINA CLAY WASTE DEPOSITS IN MEVAGISSEY BAY,
Otago Univ., Portobello (New Zealand). Marine Biological Station.
For primary bibliographic entry see Field 5C.
W75-09673

EFFECT OF POWER PLANT CHLORINATION ON ESTUARINE PRODUCTIVITY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W75-09684

DDT RESIDUES IN EUPHAUSIIDS IN THE UPPER ESTUARY OF THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5C.
W75-09690

DEPOSITION OF ZINC AND CADMIUM BY MARINE BACTERIA IN ESTUARINE SEDIMENTS,
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 5C.
W75-09692

THE ACCUMULATION OF FLUORIDE BY MARINE AND INTERTIDAL ANIMALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W75-09697

SEDIMENT RESUSPENSION AND DEPOSITION IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
C. A. Oviatt, and S. W. Nixon.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 201-217, April 1975. 10 fig, 7 tab, 64 ref, 1 plate.

Descriptors: *Estuaries, *Sediments, *Rhode Island, *On-site investigations, Sediment distribution, Sampling, Equipment, Analysis, Data collections, Suspension, Deposition(Sediments), Nitrogen, Carbon, Biomass, Sedimentation rates, Silts, Organic matter, Organic compounds, Bottom sediments.
Identifiers: *Narragansett Bay(RI).

Monthly samples of sediments deposited in traps at three locations in Narragansett Bay, Rhode Island, showed a gradient in sediment activity that increased from an annual mean of 20 + or -8.8 g/sq m/day at the head of the estuary to 51 + or -16.7 g/sq m/day at the mouth. Deposited materials were significantly higher in total organic matter, organic carbon, and nitrogen than near surface sediments on the bottom. These parameters showed a gradient that decreased toward the mouth of the bay, with organic matter dropping from 14 + or -1 to 10 + or 1% of the dry weight deposited; carbon from 5.4 + or -0.9 to 3.4 + or -1.0%; and nitrogen from 0.6 + or -0.1 to 0.4 + or -0.1%. The annual mean carbon/nitrogen ratio was 8.2 in the lower bay and 8.7 in the upper bay. Deposited materials were dominated by particles in the silt size range from 4-60 micrometers and comprised for the most part resuspended bottom sediments rather than fresh inputs of material from the water column. (Humphreys-ISWS)
W75-09736

WIND AND WAVE RELATIONSHIPS IN U.K. COASTAL WATERS,
British Meteorological Office, Brackness (England).
H. C. Shellard, and L. Draper.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 219-228, April 1975. 10 fig, 3 tab, 12 ref.

Descriptors: *Waves(Water), *Oceanography, *Coasts, *On-site investigations, Measurement, Analysis, Evaluation, Data collections, Winds, Velocity, Height, Frequency.
Identifiers: *United Kingdom.

Data from wave measurements for eight Light Vessels around the United Kingdom coasts were combined with suitable wind data to examine the relationships between the two. The results reveal the likely wave conditions and the range to be expected at each station under given wind conditions. The typical height of swell can also be deduced for each station. Frequency distributions

(parts per 1000) of wave heights at each Light Vessel and of mean wind speeds were presented in graphs. (Humphreys-ISWS)
W75-09737

FRICTION FACTOR UNDER OSCILLATORY WAVES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-09755

SEDIMENTS AND STRUCTURE OF THE JAPAN SEA,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2J.
W75-09756

PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 2, POTENTIAL ENVIRONMENTAL IMPACTS, ETC. (ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09820

CONTEMPORARY RESEARCH IN MARINE AFFAIRS,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6B.
W75-09837

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DEVELOPMENT OF POROUS POLYVINYL CHLORIDE COATED TUBULETS FOR SEA-WATER DESALINATION,
DeBell and Richardson, Inc., Enfield, Conn.
B. Baum, R. A. White, and J. Lakis.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 378, $3.75 in paper copy, $2.25 in microfiche. Office of Water Research and Technology, Report OSW-RDPR-75-1006, June 1975. 42 p, 9 tab, 6 fig, 3 ref. 14-30-3250.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Cellulose, *Permeability, Sea water.
Identifiers: *Composite membranes, Tubules, Blend membranes, Polysulfore, Acrylamide, Polyvinyl alcohol, Polyacrylic acid, *Cellulose acetate, Salt rejection, *Asymmetric membranes.

Asymmetric cellulose diacetate/triacetate membranes were cast onto 0.027 inch diameter porous polyvinyl chloride tubulets. A flux of 4 gf2d at 99% R sub s, 3.5% NaCl/1200 psi was obtained. This achieves the equivalent of 4,200 gallons per cubic foot of module per day - far in excess of commercial units. Work with NS-1 coated onto tubulets primed with acrylamide gel, asymmetric polysulfone, and asymmetric cellulose acetate was less successful. The NS-1 coating can be cured at lower temperatures by the use of triethylamine catalyst.
W75-09373

WATER QUALITY ANALYSIS SYSTEM WITH MULTICIRCUIT SINGLE SHELL HEAT EXCHANGER,
For primary bibliographic entry see Field 5G.
W75-09642

SOLAR STILL WITH REPLACEABLE SOLAR ABSORBING LINER AND WEIGHT CONTROLLED FEED INLET,
L. E. Massie.
US Patent No 3,880,719, 3 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 2210, April 29, 1975.

Descriptors: *Patents, *Solar still, *Desalination apparatus, *Waste water treatment, *Water quality control, Solar distillation, Evaporation, Heat exchangers, Water purification, Equipment.

This invention provides a solar still with an evaporating tray that is covered, or constructed of, a black pliable material that can be easily replaced, or continuously cleaned, or renewed. The weight of the fluid in the tray, or the deflection of the tray due to the weight of the fluid operates valves controlling the fluid level. Counterweights, calibrated springs, or other counterloading mechanisms are provided that can be adjusted to calibrate the fluid level control system to accommodate variations in fluid density and rate of fluid refill. A heat exchange system is also provided to convert waste heat radiated from the evaporator tray and other sources, to heat the incoming fluid. The fluid monitoring system is used to detect the accumulation of excessive water in the evaporating tray and to vent this excess fluid without contaminating the interior of the still enclosure. To protect the integrity of the still enclosure, valving, water traps and other devices are used to prevent the entry of contaminants, insects and other foreign matters. (Sinha-OEIS)
W75-09643

SYSTEM FOR THERMAL DESALTING OF WATER,
I. Z. Makinsky, E. A. Kasimzade, and S. P. Baksht.
US Patent No 3,883,400, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 729, May 13, 1975.

Descriptors: *Patents, *Desalination, *Desalination apparatus, *Waste water treatment, Evaporators, Heat exchangers, Condensers, Equipment, Distillation, Demineralization.
Identifiers: *Thermal desalination.

The specific object of the invention is to develope a system for thermal desalting of water having simple construction and providing for a low cost of the desalted water due to the use of low-potential heat of exhaust steam of a turbine without reducing the turbine efficiency. The turbine condenser is connected through a pipeline in series with an evaporator and a water-to-water heat exchanger for forming a recirculation water cooling system. The system comprises in combination: feeding and return headers for distributing cooling water in pipelines of the system; at least one steam turbine having an exhaust; condenser means connected to the exhaust through a pipeline; an adiabatic evaporator having an inlet side and a first and second outlet side, having its inlet side connected to the condenser through a pipeline; water-to-water heat exchanger having a first, second and separate third side, the first side being connected to the first outlet side of the evaporator, the second side being connected to the condenser, the third side being connected to the feeding and return header means for distributing cooling water so that fluid flowing through the heat exchanger is brought to the temperature of the cooling water; and a distilling condenser connected through a pipeline to the second outlet side of the evaporator for receiving steam. (Sinha-OEIS)
W75-09653

DESALINATION PROCESS,
Department of the Navy, Washington, D.C. (assignee)
R. E. Jensen.
US Patent No 3,883,412, 4 p, 6 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 733, May 13, 1975.

Descriptors: *Patents, *Desalination processes, Desalination apparatus, *Waste water treatment, Sea water, Brackish water, Water purification, *Ion exchange, *Electrodes.
Identifiers: Deionization.

The apparatus and method for desalination of water consists of creating a space charge layer through the use of porous charged electrodes submerged in the saline solution and thereafter removing the water from the impurity ions. The energy used in this process can be partially recovered by replacing the electrodes in another saline solution and collecting the energy produced in the external circuit due to the diffusion of the ions collected by the electrodes in the saline solution. The ions concentrate near the electrodes after application of electrical potential reducing ion concentration in the center of the cell. Partial deionization can be accomplished by removal of water near the center of the cell without disturbing space charge layers. More complete desalination may be accomplished by treating the water in several successive cells. (Sinha-OEIS)
W75-09654

REVERSE OSMOSIS APPARATUS,
United Kingdom Atomic Energy Authority, London (England). (assignee)
R. Gayler.
US Patent No 3,883,434, 3 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 739, May 13, 1975.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Water quality control, Water pollution control, Equipment, *Desalination apparatus, *Waste water treatment.

The reverse osmosis apparatus comprises: a membrane assembly placed within a pressure shell; means for passing a feed solution through the assembly so as to obtain a product liquid by reverse osmosis; and assembly driving means for rotating the assembly within the shell. Rotating the membrane assembly of a single apparatus can provide a higher recovery ratio of product liquid than several such apparatus with non-rotatable assemblies, and furthermore, any tendency for salts to be deposited can be reduced while at the same time, velocities of feed solution within the apparatus can be reduced. The assembly driving means may comprise an electric motor and gear unit, or may comprise a fluid turbine. The feed-solution or the liquid rejected by the apparatus may be used as a working fluid to drive the turbine. The apparatus may be provided with a plurality of membrane assemblies and assembly driving means for rotating them about a single axis. (Sinha-OEIS)
W75-09661

MULTI-EFFECT FLASH EVAPORATOR,
J. E. Pottharst, Jr.
US Patent No 3,884,767, 4 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1173, May 20, 1975.

Descriptors: *Patents, *Desalination, *Waste water treatment, *Desalination apparatus, Evaporators, Distillation, Multi-stage flash distillation, Sea water.

A multi-effect flash evaporator is provided wherein preheated seawater is passed into a header extending at least partially across a vessel or compartment into which the preheated feed water is to be discharged for flashing. The header has a number of restricted discharge means such as orifices, pipe nipples, and the like, distributed along its length for discharge of the preheated seawater upwardly. A flash chamber is places along

and generally above the discharge means and has downward extending sidewalls on both sides of the header to form flow passages. The flash chamber is placed at a level below that of the mist eliminator so that steam flowing down through the passages must substantially change its flow direction in order to pass upward to the mist eliminator. (Sinha-OEIS)
W75-09663

APPLICATION OF FILTRATION THROUGH SEMI-PERMEABLE MEMBRANES FOR TREATMENT OF WASTES,
For primary bibliographic entry see Field 5D.
W75-09730

OPERATING RESULTS OF ELECTRODIALYSIS AND REVERSE OSMOSIS MUNICIPAL DESALTING PLANTS,
Reynolds, Smith and Hills, Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W75-09732

ARIZONA AND TOMORROW'S SOLAR POWERPLANTS,
Arizona State Fuel and Energy Office, Phoenix.
J. Martin, and D. Halacy.
(1975). 29 p, 15 fig.

Descriptors: *Powerplants, *Project planning, *Energy conversion, *Solar radiation, *Arizona, Desalination processes, Solar distillation.
Identifiers: *Solar energy.

Reasons are presented in support of the selection of Arizona as a site for a Solar Energy Research Institute and for building of prototype and functional large-scale powerplants as authorized under or implicit in Public Law 93-473. The State's climate, with an average of some 4,000 hours of sunshine yearly, an environment that would permit large equipment to remain in the open for long periods of time without damage, plenty of available land suitable for all aspects of solar energy development, and Arizona's long record of research by some of the world's outstanding authorities in the field are described as the rationale for its selection. Drawings of such devices as solar towers and solar farms are included. As background for the arguments in favor of Arizona, the report also cites work on large solar desalination plants at the University of Arizona. (McLachlan-Arizona)
W75-09804

3B. Water Yield Improvement

EVAPORATION FROM WATER SURFACES IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2D.
W75-09586

DROUGHT, A RECURRENT ELEMENT OF CLIMATE,
Maryland Univ., College Park. Graduate Program in Meteorology.
For primary bibliographic entry see Field 2B.
W75-09799

WATER REQUIREMENTS AND LIMITATIONS IMPOSED ON AGRICULTURAL DEVELOPMENT IN NORTHERN GHANA,
For primary bibliographic entry see Field 3F.
W75-09800

3C. Use Of Water Of Impaired Quality

CLOSING UP A FINE GRADE PAPER MACHINE SYSTEM,
MacMillan Bloedel Ltd., New Westminster (British Columbia).
For primary bibliographic entry see Field 3E.
W75-09353

WHERE ARE WE IN FOREST FERTILIZATION,
State Univ. New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5D.
W75-09367

DEVELOPMENT AND SCOPE OF DRIP AND SUBSURFACE IRRIGATION,
Udaipur Univ. (India).
M. T. Deshmukh.
In: Proceedings of the Second International Drip Irrigation Congress, p 52-57, (1974). 31 ref.

Descriptors: Agriculture, Irrigation, Subsurface irrigation, Salinity, Saline water.
Identifiers: *Trickle irrigation, *Drip irrigation.

Drip irrigation is quite suitable for arid and semi-arid regions characterized by poor saline soil, saline irrigation water, and high evapotranspiration rates. In this method, water is applied slowly and continuously to the crops on the ground surface with the help of pipes having perforations or emitters fixed at suitable intervals along the length of the pipe. Developments in the drip method of irrigation are reviewed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09431

STRIP CULTIVATION OF THE AREA WETTED BY DRIP IRRIGATION IN THE ARAVA DESERT,
Hebrew Univ., Rehovth (Israel).
S. D. Goldberg, and M. Uzrad.
In: Proceedings of the Second International Drip Irrigation Congress, p 142-147, (1974).

Descriptors: *Strip cropping, *Saline water, *Salinity, *Sprinkler irrigation, Melons, Irrigation practices, Irrigation, Agriculture, Corn(Field).
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel(Arava Desert).

Drip irrigation cultivation is in effect strip cultivation and represents almost the most intensive form of cultivation. Throughout the growing season the cultivated strip gets a more intensive set of treatments. Under arid climatic conditions in light soils and with saline water (like in the Arava), these strips will undergo considerable chemical and physical changes with would materially differ from the intermediary uncultivated strips. The problem posed was whether the cultivated strips were better, worse, or of no difference compared to the uncultivated strips. Results show that the cultivated strips were superior to the uncultivated strips. (See also W75-09423) (Skogerboe-Colorado State)
W75-09445

MOISTURE PROFILES AND SALINIZATION OF SOILS UNDER DRIP IRRIGATION IN THE REPUBLIC OF SOUTH AFRICA,
South Africa Dept. of Agricultural Technical Services, Pretoria.
A. Streutker.
In: Proceedings of the Second International Drip Irrigation Congress, p 258-263, (1974). 4 tab.

Descriptors: *Saline soils, Moisture content, *Crop production, Flow rates, Cotton, Potatoes, Tomatoes, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Moisture profiles, *South Africa.

Soil moisture profiles, salinization of soils, water use, and production of cotton, potatoes and tomatoes are measured on experimental plots on four soils, from sand to clay, with three different dripper spacings, and three different drip intensities. Simultaneously, soil moisture profiles and salinization are measured on different soils under citrus-trees, peach-trees and vineyards with commercial drip irrigation systems under different climates. (See also W75-09423) (Skogerboe-Colorado State)
W75-09464

SALINITY SENSOR CONTROL OF DRIP IRRIGATION WATER APPLICATION,
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, and J. D. Oster.
In: Proceedings of the Second International Drip Irrigation Congress, p 335-340, (1974). 3 fig, 1 tab, 1 ref.

Descriptors: Salinity, *Saline soils, Crop response, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Salinity sensors, *Milo.

In-situ salinity sensors were used to control water application by drip irrigation to maintain a constant soil salinity. Milo was grown on small field plots instrumented with salinity sensors to evaluate the effect of depth of placement and initial soil salinity on plant growth and water control. Water application was fully controlled by the sensors. Response time was short enough to encourage practical use. (See also W75-09423) (Skogerboe-Colorado State)
W75-09477

SOIL SALINITY DISTRIBUTION IN DRIP AND SUBSURFACE IRRIGATED SUMMER SQUASH,
Agricultural Research Service, Riverside, Calif.
K. R. Davis, and W. F. Spencer.
In: Proceedings of the Second International Drip Irrigation Congress, p 358-363, (1974). 3 fig, 2 tab, 4 ref.

Descriptors: *Salinity, *Subsurface irrigation, *Irrigation practices, *Soil water movement, Management, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Squash.

Salt and water distribution patterns were determined around a porous tubing as part of a study to evaluate several drip and subsurface irrigation lines at Riverside, California. Generalized plot sampling after seasonal rainfall established initial soil salinity and water levels. A detailed scheme was employed for mid-season and end-season soil sampling. Soil salinity and water distributions before, during, and after the 1973 growing season of zucchini squash are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09481

AFFORESTATION WITH SALINE WATER IN ABU DHABI,
Ministry of Agriculture, Abu Dhabi (United Arab Emirates).
S. Tahnoon, and F. K. Aljibury.
In: Proceedings of the Second International Drip Irrigation Congress, p 370-371, (1974).

Descriptors: *Forestry, *Saline water, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Abu Dhabi.

The government of the country of Abu Dhabi is trying to make the desert bloom under adverse soil, wind, and water conditions. At present, three drip irrigation projects are underway. (See also W75-09423) (Skogerboe-Colorado State)
W75-09483

SALINITY MANAGEMENT FOR HIGH FREQUENCY IRRIGATION,
Agricultural Research Service, Riverside, Calif.
G. J. Hoffman, S. L. Rawlins, J. D. Oster, and S. D. Merrill.
In: Proceedings of the Second International Drip Irrigation Congress, p 372-375, (1974). 4 fig.

Descriptors: *Salinity, *Saline soils, *Saline water, *Leaching, Grain sorghum, Lettuce, Wheat, Crop response, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, High frequency irrigation.

A field plot experiment designed to determine the minimum leaching required to maintain crop yields under high frequency irrigation is described. Two varieties of wheat, grain sorghum, and lettuce are being grown in rotation each year in six replicated leaching fraction treatments. Precise measurements of the volume and salt concentration of the irrigation and drainage waters along the in situ soil salinity measurements and crop yield are reported. (See also W75-09423) (Skogerboe-Colorado State)
W75-09484

IRRIGATION RETURN FLOW AS INFLUENCED BY DRIP IRRIGATION,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 5G.
W75-09485

AUSTRALIAN VINEYARD USES SEWAGE EFFLUENT WITH TRICKLE IRRIGATION,
Kinnaird, Hill, deRohan and Young Ltd., Kensington and Norwood (Australia).
A. L. Read, M. F. Pietsch, and W. E. Matheson.
In: Proceedings of the Second International Drip Irrigation Congress, p 382-387, (1974).

Descriptors: Effluents, *Sewage, *Sewage disposal, *Sewage effluents, Vine crops, Irrigation, Irrigation systems, Irrigation practices, Agriculture, Clogging.
Identifiers: *Trickle irrigation, *Drip irrigation, *Grapes.

The Angle Vale Vineyard is located 32 kilometres north of Adelaide, South Australia. Supplementary irrigation is necessary for the growth of vines in the area. In 1970, Government legislation precluded the future use of water in the area, and a decision was made to use sewage effluent from Adelaide which was the only supplementary irrigation available. The 40 hectare vineyard had trickle irrigation installed and has since been enlarged to 180 hectares. The effluent has a T.D.S. varying from 1,300 to 1,800 mg/l and a varying but high algal content. The paper describes the problems of filtration and growths within the pipelines and how these problems were overcome. Monitoring of soil conditions has been necessary to study the changes in soil salinity. Maximum salinities have occurred at the perimeter of the wetted zone, approximately 50 cms from the vine rows. Total soluble salts have increased from 0.035% in the centre of the vine rows to 0.086-0.109% at the perimeter of the wetted zones. Analyses of the vine leaves and wine made from the first vintage are also reported. (See also W75-09423) (Skogerboe-Colorado State)
W75-09486

EFFECTS OF LOCALIZED PHOSPHATE TREATMENTS AND SOLUTION PH ON THE GROWTH AND FUNCTION OF APPLE ROOTS,
Victoria Dept. of Agriculture, Ferntree Gully (Australia). Scoresby Horticultural Research Station.
B. K. Taylor, and F. G. Goubran.
In: Proceedings of the Second International Drip Irrigation Congress, p 395-399, (1974). 4 tab.

Descriptors: *Phosphates, *Crop response, *Apples, *Root development, Nutrients, Irrigation systems, Irrigation, Agriculture, Hydrogen ion concentration, Growth rates.
Identifiers: *Trickle irrigation, *Drip irrigation.

Following the introduction of trickle irrigation to orchards, interest has risen in the possibility of feeding nutrients into such systems on a regular basis. Use of phosphatic fertilizer in this way, however, could pose a problem in that a highly localized source of P would be available to only a small portion of the root system of the tree. Movement of P away from the trickle outlet would be restricted in most orchard soils by fixation processes. The influence of localized applications of phosphate on the growth and function of apple roots at two pH levels is reported. (See also W75-09423) (Skogerboe-Colorado State)
W75-09488

DRIP IRRIGATION EXPERIMENT ON AVOCADOS,
California Univ., San Diego, La Jolla.
C. D. Gustafson, A. W. Marsh, R. L. Branson, and S. Davis.
In: Proceedings of the Second International Drip Irrigation Congress, p 443-445, (1974).

Descriptors: *Crop response, *Crop productivity, *Salinity, Sprinkler irrigation, Cost comparisons, Diseases, Irrigation, Agriculture.
Identifiers: *Avocados, *Trickle irrigation, *Drip irrigation.

In June, 1970 an irrigation project was initiated to compare drip irrigation with the conventional spitter-sprinkler system, commonly used in avocado orchards. Evaluation of the two methods include: (1) a comparison of growth and productivity; (2) salinity accumulation and distribution in soils under each system; (3) annual costs to operate each system; (4) determine if trees are more or less susceptible to the avocado root rot disease; and (5) observe operation of equipment. (See also W75-09423) (Skogerboe-Colorado State)
W75-09499

DISPOSAL OF CATTLE FEEDLOT RUNOFF ON AGRICULTURAL LAND,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-09517

FOR IMPROVING WATER PENETRATION INTO SOME ARIZONA SOILS-SULFURIC ACID,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, and J. L. Stroehlein.
Progressive Agriculture in Arizona, Vol 27, No 2, p 13-16, March-April, 1975. Published by College of Agriculture, University of Arizona, Tucson. 1 fig, 4 tab, 2 ref.

Descriptors: *Soil management, *Arid lands, *Irrigation, *Sulfur compounds, *Penetration, Sulfur, Acidity, *Arizona, Permeability, Soil amendments, Flocculation, Salinity, Saline soils, Water quality, Soil chemical properties.
Identifiers: *Sulfuric acid.

Sulfuric acid, a waste product of the copper industry, is useful in improving water penetration into some Arizona soils. The effectiveness of sulfuric acid treatments depends not only upon the concentration of sodium and calcium in soils and water, but also upon the types of soils and the rates and methods of acid application. The effectiveness of acid treatment in increasing the rate of water penetration is discussed for soils and irrigation waters commonly found in southern Arizona. Because of soil variability and diverse irrigation practices, the amount of acid applied is site specific and caution must be exercised. The quality of irrigation water is another key variable. Five steps for field application of sulfuric acid are given. (Bowden-Arizona)
W75-09623

MIX GYPSUM IN SHALLOW DEPTHS--IN SALINE SOILS,
Central Soil Salinity Research Inst., Karnal (India).
B. K. Khosla, K. S. Dargan, and I. P. Abrol.
Indian Farming, Vol 23, No 1, p 35, April 1973. 1 fig.

Descriptors: *Gypsum, *Wheat, *Barley, *Soil surfaces, *Crop production, *Saline soils, Soil profiles, Fertilizers, Sodium.
Identifiers: *Paddy, *India.

In saline sodic soils, highest yields of paddy and wheat were obtained when gypsum was added to the upper 10 cm of the soil surface. Yields decreased when gypsum was mixed at levels 20 cm and 30 cm below the surface. The yield of paddy was 70.21 quintals per hectare when gypsum was mixed in at the 10 cm depth, and was reduced to 60.52 and 65.44 quintals per hectare when gypsum was added to the 20 and 30 cm depths respectively. In the case of wheat, 32.80 quintals per hectare were obtained when gypsum was mixed at the 10 cm level, and yields of 31.57 and 20 quintals per hectare were gathered with gypsum mixed at the 20 and 30 cm depths. It is suggested that gypsum be mixed in the surface 10 cm of soil for shallow rooted crops like paddy, wheat, and barley to obtain the highest possible yields. (Mastic-Arizona)
W75-09786

GYPSUM CAN IMPROVE YOUR WATER ALSO,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 5G.
W75-09787

SEWAGE UTILIZATION IN AGRICULTURE,
Central Public Health Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5D.
W75-09788

FLOW-ASSOCIATED PRECIPITATION REACTIONS IN SALINE-SODIC SOILS AND THEIR SIGNIFICANCE,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 2G.
W75-09792

IN SALT-AFFECTED SOILS MULCHING AIDS IN CROP GROWTH,
Central Soil Salinity Research Inst., Karnal (India).
I. P. Abrol, and O. P. Dhankhar.
Indian Farming, Vol 23, No 1, p 26-28, April 1973. 3 fig.

Descriptors: *Mulching, *Saline soils, *Evaporation, *Leaching, *Irrigation, Gypsum, Soil surfaces, Calcium, Sodium, *Crop production, Fertilization, Soil profiles, Salts.
Identifiers: *Rice husks, *India.

Mulching can increase crop yields as much as 100 percent in salt-affected areas by preventing upward movement of salts from the lower soil layers. Because rice husks are not only a common waste product, but also difficult to dispose of, they were tested to determine their effectiveness as a mulch for preventing salt movement in a highly saline-sodic soil. Data on soil moisture and distribution of salts in the soil profile were collected to observe salt movement in different layers. Fertilizers were applied and usual irrigation and other cultural practices were followed during the crop season. A high yield of paddy was obtained from gypsum treated plots. In addition yields increased with increasing depths of rice husk mulch for both the gypsum treated and the untreated plots. The mulch prevented upward movement of salts by checking evaporation at the soil surface, and also kept the soil wet and solubilized some of the native calcium sources for use by the crops. (Mastic-Arizona)
W75-09798

3D. Conservation In Domestic and Municipal Use

THE OPTIMUM DISTRIBUTION OF URBAN WATER SUPPLIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 4A.
W75-09377

OCEAN WASTE DISPOSAL PRACTICES IN METROPOLITAN AREAS OF CALIFORNIA,
Interstate Electronics Corp., Anaheim, Calif.
C. F. McFarlane.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-230 944. $4.75 in paper copy, $2.25 in microfiche. Report 4460C1635, February, 1974. 95 p, 12 fig, 15 tab, 26 ref.EPA Contract 68-01-0796.

Descriptors: *Waste disposal, *Surveys, *California, Data collections, Guidelines, Urban areas.
Identifiers: *Ocean disposal.

The results of a fact-finding survey of ocean waste disposal practices in the Southern California and San Francisco Metropolitan areas of California are presented. The survey is a portion of an extensive study on waste ocean disposal practices in selected areas of the United States. Information was collected by field interviews and survey techniques and was supplemented by literature and data studies. The sum of the information establishes a data base for the development of guidelines and criteria for the control of ocean waste disposal. (Prague-FIRL)
W75-09391

STORM WATER MANAGEMENT MODEL: USER'S MANUAL, VERSION II,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W75-09579

REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2A.
W75-09621

INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

3E. Conservation In Industry

CLOSING UP A FINE GRADE PAPER MACHINE SYSTEM,
MacMillan Bloedel Ltd., New Westminster (British Columbia).
J. G. Bayda.
Preprint, Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1975, p 53-55B, 3 fig.

Descriptors: *Pulp wastes, *Water reuse, *Water conservation, Industrial wastes, Water pollution sources, Pulp and paper industry, Suspended solids, Recycling, Water treatment, Filtration, Water pollution control, Biochemical oxygen demand, Canada, Closed conduit flow.
Identifiers: Savealls, White water, Paper machines.

Island Paper Mills, a division of MacMillan Bloedel Ltd. in Vancouver, is an integrated paper mill producing fine papers in basis weights of 23 to 150 lb/3000 sq ft. The effluent quality leaving the process was upgraded by internal reclaim and recycle of suspended solids from various streams including press tray water and wire return roll shower water. To handle the excess volume of water containing fibers and fillers, a rich/lean white water system was designed. The seal pit is divided into two sections, one containing rich white water and the other containing dirtier streams. Contents of the latter side of the pit are sent to the saveall, and reclaimed solids are returned to the pulper. The saveall-clarified water is used for low-level makeup to the seal pit and the rich white water tank, with excess going to the sewer. As a result of closing the system, suspended solids load and BOD in the process effluent are below 15 lb/ton and effluent volume is about 7000 imperial gal/ton. Machine runnability has been maintained, and paper quality problems relating to the closed system have not been encountered. (Sykes-IPC)
W75-09353

RECYCLING A SOLID WASTE FROM A PAPER PLANT -- SEPARATION OF WOOD FIBER FROM CLAY BY DIFFERENTIAL FLOCCULATION,
British Columbia Univ., Vancouver. Dept. of Mineral Engineering.
For primary bibliographic entry see Field 5D.
W75-09354

PAPER MACHINE CIRCULATION SYSTEMS -- FLOWS, CONSISTENCIES, RECOVERY, AND POLLUTION (LES CIRCUITS DE LA MACHINE A PAPIER -- DEBITS, CONCENTRATIONS, RECUPERATIONS ET POLLUTIONS),
J. Vilars.
Papier, Carton et Cellulose, Vol 23, No 5, p 72-77; No 7, p 36-39, May, July, 1974. 7 fig, 4 tab.

Descriptors: *Water circulation, *Water conservation, *Recirculated water, *Industrial water, Mathematical studies, Water pollution sources, Freshwater, Waste water treatment, Flotation, Sedimentation, Filtration, Water pollution, Water pollution control, Flow, Closed conduit flow, Pulp and paper industry.
Identifiers: *Paper machines, *White water, Consistency.

Primary paper machine water circulation systems are examined in detail, particularly with respect to formulas and calculations relating to flow, consistency, and recirculation in systems with combined treatment of all white waters, in systems with addition of fresh water, in systems with separation of table-roll (or hydrofoil) white water and suction-box white water, in systems with separate treatment of white waters with addition of clear water to the suction-box white water, and in systems with separate treatment of white waters with addition of fresh water ahead of the headbox or in the table-roll circuit. The desirability of separate treatment of white waters, maintaining minimum white water consistency, and avoiding the introduction of fresh water is pointed out. Secondary water-circulation systems are also examined, including the need for using a minimum amount of fresh water, the principles of sedimentation, flotation, and filtration clarifiers used in fiber and filler recovery, the supply of paper-machine showers, and the paper-machine stock supply system. (Speckhard-IPC)
W75-09357

PROCESS FOR THE RECOVERY OF FORMALDEHYDE AND PHENOL CONTAINED IN WASTE WATERS,
For primary bibliographic entry see Field 5D.
W75-09573

PROJECTS IN THE INDUSTRIAL POLLUTION CONTROL DIVISION - DECEMBER 1974.
Environmental Protection Agency, Washington, D.C. Industrial Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-09578

TIDE ENERGY CONVERSION DEVICE,
For primary bibliographic entry see Field 8A.
W75-09650

GEOCHEMISTRY APPLIED TO THE DISCOVERY, EVALUATION, AND EXPLOITATION OF GEOTHERMAL ENERGY RESOURCES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-09724

INFLUENCE OF THE ENERGY CRISIS UPON THE FUTURE OF ENVIRONMENTAL POLICY,
Committee on Interior and Insular Affairs (U.S. Senate).
For primary bibliographic entry see Field 6E.
W75-09847

3F. Conservation In Agriculture

EFFECT OF ROOT TEMPERATURE AND HUMIDITY ON THE DISTRIBUTION OF CA IN APPLE AND SUNFLOWER SEEDLINGS,
Washington State Univ., Pullman. Dept. of Horticulture.
For primary bibliographic entry see Field 2I.
W75-09351

AN INVESTIGATION OF FACTORS AFFECTING THE INTENSITY OF WATER USE IN THE LAJAS VALLEY IRRIGATION PROJECT,
Puerto Rico Univ., Mayaguez. Dept. of Agricultural Economics.
P. I. A. Cordero.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 381, $4.25 in paper copy, $2.25 in microfiche. Puerto Rico Water Resources Research Institute, Mayaguez, Completion Report, September 1974. 61 p, 9 fig, 24 tab, 26 ref. OWRT A-036-PR(1).

Descriptors: Farms, Irrigation, Topography, *Water utilization, *Irrigation structures, *Drainage structures, Water supply, Costs, *Puerto Rico, *Irrigation water, Rainfall intensity.
Identifiers: *Lajas Valley(P.R.), *Rainfall frequency.

Effects of a group of socio-economic factors on the intensity of irrigation water use in Lajas Valley, Puerto Rico were investigated. The factors were: size of farms, ownership of farms, available labor for the operation of irrigation systems, costs

of irrigation, employment of farmers in non-agricultural activities, administration of irrigation services, topography of the farms, and soil permeability. The following had a direct significant relationship with the intensity of irrigation water use in available labor for the operation of irrigation systems, irrigation costs, topography, and soil permeability. The other factors studied did not present a significant relationship. The data obtained are of paramount importance for government agencies that are involved in the development of the Lajas Valley Irrigation Project and similar irrigation systems in Puerto Rico.
W75-09376

AGRICULTURAL BENEFITS AND ENVIRONMENTAL CHANGES RESULTING FROM THE USE OF DIGESTED SLUDGE ON FIELD CROPS,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W75-09409

PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
Held July 7-14, 1974, at San Diego, California. (1974), 569 p, $10.00.

Descriptors: Crop response, Design, Design criteria, Design flow, Economics, Evaporation pans, Fertilization, Furrow irrigation, Hydraulic properties, Infiltration, *Irrigation effects, *Irrigation efficiency, *Irrigation practices, Irrigation water, Mathematical models, Orifice flow, Orchards, Return flow, Root development, Salinity, Soil water movement, Subsurface irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, Wetting pattern.

Research related to trickle irrigation (drip irrigation) is being conducted throughout the United States and in many other countries. The 101 papers presented discuss topics such as design methods, hydraulics, crop response, salinity, water filtration, fertilization, irrigation scheduling, emitter design, emitter clogging, wetting patterns, and much more as related to this relatively new irrigation method. (See W75-09424 thru W75-09514) (Skogerboe-Colorado State)
W75-09423

DRIP IRRIGATION-WORLDWIDE,
California Univ., San Diego, La Jolla.
C. D. Gustafson, A. W. Marsh, R. L. Branson, and S. Davis.
In: Proceedings of the Second International Drip Irrigation Congress, p 17-22, (1974). 1 fig.

Descriptors: *History, *Irrigation practices, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation.

Good water supplies are always in demand. All around the world, problems with water are: short supply, poor quality and/or expensive. In reviewing the development of drip irrigation, it is apparent that the greatest interest is in areas where there is a problem with water supplies. Poor soils or steep terrain also encourages the use of drip irrigation. Drip irrigation has been used for years. What is new, however, is its application to modern agriculture. On a commercial scale in the United States, it can be traced to 1969-70. That was not the beginning, however, since many industries have been using some type of drip irrigation for a long time. Drip irrigation had its beginning in the greenhouse culture after World War II in the United Kingdom. (See also W75-09423) (Skogerboe-Colorado State)
W75-09424

THE PROGRESS AND PROBLEMS OF DRIP IRRIGATION IN ISRAEL,
Hebrew Univ., Rehovoth (Israel).
E. Rawitz, and D. Hillel.
In: Proceedings of the Second International Drip Irrigation Congress, p 23-28, (1974). 18 ref.

Descriptors: Crop response, Design criteria, History, Irrigation, Irrigation system, *Irrigation practices, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel.

The 'state of the art' of drip irrigation in Israel is reviewed regarding both equipment and operational practices. Available equipment is generally reliable in conforms to manufacturer's specifications of hydraulic properties. Filtering and clogging of small discharge orifices remains a problem under certain conditions. A standard head has been developed for connection to the main system incorporating filter, vacuum breaker, fertilizer applicator, pressure regulator, and automatic valves. Hydraulically or electrically actuated automatic valves are used either singly or for sequential operation. Many growers have reported excellent results with drip irrigation of orchards, truck crops, and flowers. The relative advantages of drip irrigation are especially pronounced where relatively saline water must be used under extremely arid conditions. Criteria and recommendations have yet to be determined regarding irrigation frequency and application amounts in relation to emitter spacing and discharge, and percent of wetted area for different crops, soil profile characteristics, climatic conditions, and water quality. Some consequences of improper operation may be under-irrigation, excessive restriction of the root zone, and excessive leaching of water and nutrients below the rooting depth. (See also W75-09423) (Skogerboe-Colorado State)
W75-09425

DRIP IRRIGATION AND AUTOMATION TOOLS IN EFFICIENT USE OF WATER POLICY,
Ministry of Agriculture, Safad (Israel).
H. Paldi.
In: Proceedings of the Second International Drip Irrigation Congress, p 29-32, (1974).

Descriptors: *Automation, *Water policy, *Water conservation, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel.

Discussed are water savings in Israel with drip irrigation, long range irrigation plans for Israel, and irrigation system automation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09426

DRIP IRRIGATION DESIGN CRITERIA FOR TREE CROPS IN FLORIDA AND OTHER HUMID REGIONS,
Florida Univ., Gainesville.
D. S. Harrison, and J. M. Myers.
In: Proceedings of the Second International Drip Irrigation Congress, p 33-37, (1974). 11 ref.

Descriptors: *Orchards, *Crop response, *Florida, *Humid area, Irrigation practices, Citrus fruits, Irrigation, Agriculture, Irrigation systems, Irrigation design.
Identifiers: *Drip irrigation, *Trickle irrigation.

Drip irrigation has been installed on approximately 4,000 acres of citrus and other orchard crops in Florida during the past 2 years. Some of the reasons for increased interest in this method of irrigation are: (1) conservation of water, (2) labor savings, (3) lower operating costs, and (4) lower power requirements. Some problems have developed and the future of drip irrigation in Florida will depend on how those problems are dealt with. Among significant problems are: (1) improper water filtration, (2) research data on crop response not readily available, (3) vandalism, (4) unavailability of fully tested design criteria, (5) emitter spacing, and (6) expected life. Two years research data in Florida on strawberries, and one year on tomatoes show that response to drip irrigation is comparable to other application methods and water savings as much as 60-70% may be expected. Fertilizer response, when applied through the drip system, has been outstanding. (See also W75-09423) (Skogerboe-Colorado State)
W75-09427

DRIP IRRIGATION RESEARCH IN OREGON - A PROGRESS REPORT,
Oregon State Univ., Corvallis.
M. N. Shearer, L. W. Martin, P. B. Lombard, and W. M. Mellenthin.
In: Proceedings of the Second International Drip Irrigation Congress, p 38-43, (1974). 4 fig, 3 tab.

Descriptors: Crop response, *Crop production, Sugarcane, *Oregon, Irrigation system, Irrigation, Agriculture, *Sprinkler irrigation, Filtration.
Identifiers: *Trickle irrigation, *Drip irrigation, Pears.

Drip irrigation research was initiated in Oregon in 1973. One year's results are reported on the following: (1) total yield, fruit size, and water requirements, of cane fruit under drip and sprinkler irrigation, (2) total yield, fruit size, and water requirements of pears grown on low intake rate montmorillonite soils under drip and rill irrigation, (3) evaporation pan coefficients for scheduling drip irrigation, and (4) filtering requirements for irrigation water containing glacial silt and debris. (See also W75-09423) (Skogerboe-Colorado State)
W75-09428

DRIP IRRIGATION IN LANDSCAPING AND SOIL EROSION CONTROL,
Kuluwai Irrigation Corp., Haleiwa, Hawaii.
For primary bibliographic entry see Field 4D.
W75-09429

RESEARCHES AND APPLICATIONS ON DRIP IRRIGATION AND SIMILAR METHODS IN ITALY,
Pisa Univ. (Italy).
P. Grossi.
In: Proceedings of the Second International Dri Irrigation Congress, p 46-51, (1974).

Descriptors: Irrigation systems, Agriculture, Irrigation practices, Research and development.
Identifiers: *Trickle irrigation, *Drip irrigation, *Italy.

Research progress with trickle irrigation is discussed along with the hydraulic, pedological, and agronomical results of this research. (See also W75-09423) (Skogerboe-Colorado State)
W75-09430

DEVELOPMENT AND SCOPE OF DRIP AND SUBSURFACE IRRIGATION,
Udaipur Univ. (India).
For primary bibliographic entry see Field 3C.
W75-09431

DRIP IRRIGATION ON CITRUS,
Zebediela Estates (South Africa).
D. H. Bester, D. C. Lotter, and G. H. Veldman.
In: Proceedings of the Second International Drip Irrigation Congress, p 58-64, (1974). 2 fig, 1 tab.

Descriptors: *Evaporation pans, Irrigation, Agriculture, Sprinkler irrigation, Wetting, Fertilization, Filtration, Orchards, *Citrus fruits.
Identifiers: *Trickle irrigation, *Drip irrigation, South Africa.

A study was conducted on citrus to establish the comparative efficiency of drip irrigation, dragline sprinkler irrigation, and a hose system discharging water directly into irrigation basins in South Africa. The following aspects of drip irrigation were investigated: (1) Soil moisture determinations and wetting patterns, (2) the possibility of using an evaporation pan to determine irrigation requirements, (3) the effect of different numbers of spacing of drippers per tree, (4) the effect of different dripper discharge rates, (5) practicability of using microtubes as drippers, (6) the possibility of applying fertilizers through a drip irrigation network, and (7) factors affecting the distribution efficiency of a drip irrigation system. (See also W75-09423) (Skogerboe-Colorado State)
W75-09432

SOME RESULTS OF A FIELD SURVEY OF DRIP IRRIGATION SYSTEMS IN THE REPUBLIC OF SOUTH AFRICA,
South Africa Dept. of Agricultural Technical Services, Pretoria.
W. J. Uys.
In: Proceedings of the Second International Drip Irrigation Congress, p 65-70, July 1974. 4 tab.

Descriptors: *Clogging, Flow rates, *Surveys, Irrigation, Irrigation systems, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *South Africa.

An extensive survey was conducted in the Republic of South Africa to evaluate existing drip irrigation systems under a variety of climatic, soil, crop and management conditions. The purpose of the survey is to evaluate these systems under practical farming conditions and to identify specific problems of design, operation, and management from which future extension and research programs can be formulated. (See also W75-09423) (Skogerboe-Colorado State)
W75-09433

USE OF DRIP IRRIGATION IN GERMANY,
Kassel Univ. (West Germany).
P. Wolff.
In: Proceedings of the Second International Drip Irrigation Congress, p 71-76, (1974).

Descriptors: *Sprinkler irrigation, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Germany.

Irrigation methods similar to drip irrigation have been used in Germany for many years, and more horticulturalists are changing from overhead irrigation to drip irrigation. The reasons for changing irrigation methods were investigated. The horticulturalists are changing methods because of increasing labor costs and an increasing demand for high quality products. (See also W75-09423) (Skogerboe-Colorado State)
W75-09434

DRIP IRRIGATIONS INHERENT REQUISITE - WATER QUALITY,
Scientific Irrigation Systems, El Monte, Calif.
For primary bibliographic entry see Field 5D.
W75-09435

EDAPHIC MICRO-TUBULAR CONTINUOUS FLOW IRRIGATION IN CANADA,
Department of Agriculture, Summerland (British Columbia).
For primary bibliographic entry see Field 2G.
W75-09436

TRICKLE IRRIGATION,
Ministry of Agriculture, Tel-Aviv (Israel). Irrigation and Soil Field Service.
M. Shani.
In: Proceedings of the Second International Drip Irrigation Congress, p 91-96, July 1974.

Descriptors: *Filtration, *Fertilization, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel.

Advantages and disadvantages are presented of trickle irrigation, types of emitters, filtration methods, and fertilization techniques based on experience in Israel. (See also W75-09423) (Skogerboe-Colorado State)
W75-09437

VEGETABLE PRODUCTION AND WATER-USE EFFICIENCY AS INFLUENCED BY DRIP, SPRINKLER, SUBSURFACE, AND FURROW IRRIGATION METHODS,
New Mexico State Univ., University Park.
E. G. Hanson, and T. C. Patterson.
In: Proceedings of the Second International Drip Irrigation Congress, p 97-102, (1974).

Descriptors: *Sweet corn, Onions, *Crop response, *Irrigation practices, *Vegetable crops, Irrigation systems, *Sprinkler irrigation, *Subsurface irrigation, *Furrow irrigation, Soil moisture, Salinity, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Sweet corn and onions have been grown on replicated plots with four methods of irrigation: drip, subsurface, sprinkler, and furrow. Half of the plots have been irrigated to maintain the soil moisture tension at or below 0.20 atmospheres, and the other half at or below 0.60 atmospheres. Yield, quality, and water-use efficiency pertaining to each crop are reported for three growing seasons. Changes in soil salinity are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09438

COMPARISON OF IRRIGATION METHODS, ROOTSTOCKS, AND FERTILIZER ELEMENTS OF VALENCIA ORANGE TREES,
Arizona Univ., Yuma.
R. L. Roth, D. R. Rodney, and B. R. Gardner.
In: Proceedings of the Second International Drip Irrigation Congress, p 103-108, (1974).

Descriptors: *Sprinkler irrigation, *Surface irrigation, *Oranges, *Fertilization, Fertilizers, Saline water, Saline soil, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: Irrigation method comparison, *Trickle irrigation, *Drip irrigation, Micronutrients.

A 4-hectare (10-acre) block of 'Campbell' valencia orange trees planted in May 1971, was used to compare 5 irrigation methods, 2 types of rootstocks, and a phosphate and micronutrient variable. The irrigation methods were border, full-coverage sprinklers, limited-coverage sprinklers, basin, and trickle. Maximum tree growth, as measured by increase in trunk circumference, was achieved from the trickle and basin irrigation methods, even though these methods used approximately one-twentieth the water as compared to the normal border irrigation method. The full-coverage sprinkler method restricted tree growth due to salt injury of the leaves. Nitrate and salt concentrations in the root zone were mapped for each irrigation method. No observable effects of the fertilizer variables have been detected at this time. (See also W75-09423) (Skogerboe-Colorado State)
W75-09439

DRIP IRRIGATION: SURFACE AND SUBSURFACE COMPARED WITH SPRINKLER AND FURROW,
Agricultural Research Service, Riverside, Calif.
S. Davis, and W. J. Pugh.
In: Proceedings of the Second International Drip Irrigation Congress, p 109-114, (1974). 3 fig, 2 tab, 2 ref.

Descriptors: *Furrow irrigation, *Sprinkler irrigation, *Subsurface irrigation, Melons, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, Squash.

Four studies are described that compared crop response to various combination of drip, subsurface, furrow and sprinkler irrigation. Study concludes that (1) when the amount of water applied is near the consumptive use requirements, subsurface irrigation has greater production and better water use efficiency, (2) less water is needed for drip and subsurface irrigation than for furrow or sprinkler irrigation, because less water is lost to direct evaporation and deep percolation, and (3) the applicators used applied water equally well to the surface or subsurface soil, except where deposits from evaporation occurred. (See also W75-09423) (Skogerboe-Colorado State)
W75-09440

CHAMBER METHOD FOR DRIP IRRIGATION SYSTEM DESIGN AND INSTALLATION PROCEDURE,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 8C.
W75-09441

THE USE OF FOGGERS IN DRIP IRRIGATION,
Perma-Rain Irrigation, Inc., Lindsay, Calif.
R. O. Schade.
In: Proceedings of the Second International Drip Irrigation Congress, p 129-130, (1974).

Descriptors: Crop response, Irrigation systems, *Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Foggers.

The rapid increase in drip irrigation in the United States has been accompanied by a large number of new products for its application. Most of this new equipment has been emitters of various types. These emitters are used to reduce the flow and to apply the water directly to the surface of the soil. In addition to emitters a device known as a fogger is also being widely used. The fogger fogs or sprays the water into the air. The droplet size and output of each fogger ranges from 2 to 5 gallons per hour which is comparable to the discharge rate of most emitters being used today. Foggers have been installed on an estimated 8,000 acres. This accounts for approximately 15% of the acreage being irrigated by drip irrigation. Foggers are being used to irrigate citrus, decidious fruit, grapes, nuts and ornamentals. The area of principal usage is the San Joaquin Valley of California. (See also W75-09423) (Skogerboe-Colorado State)
W75-09442

A CONSTANT MICRO SOURCE OF MOISTURE AS A COMPONENT IN A GRADIENT SYSTEM FOR A HIGH LEVEL PRODUCTION,
Agricultural Research and Educational Center, Bradenton, Fla.
C. M. Geraldson.
In: Proceedings of the Second International Drip Irrigation Congress, p 131-136, (1974). 4 fig, 4 ref.

Descriptors: *Nutrients, Agriculture, Irrigation, Crop production, *Moisture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Micro-pore tubing.

The objective was to evaluate the use of a constant micro source of moisture which could be used as an alternative to a constant water table in establishing nutrient gradients for optimal production. Constant moisture was supplied by drip (trickle system) or by micro pore tubing. Soluble

nutrients were supplied primarily by banded placement on the soil bed surface. Relative placement of fertilizer, moisture and plants as the major variables were evaluated in conjunction with different soils as well as the sources of moisture. A consistent high level production of vegetables and flowers was attained by integrating contributing components such as soil, moisture, fertilizer and plants to establish the desired gradient system. The resultant effect in conjunction with synthetic mulch as a protective component minimizes or eliminates these components as contributing variables. (See also W75-09423) (Skogerboe-Colorado State)
W75-09443

DISINFECTION OF SOIL STRIPS THROUGH THE DRIP IRRIGATION SYSTEM,
Hebrew Univ., Rehovth (Israel).
For primary bibliographic entry see Field 5G.
W75-09444

STRIP CULTIVATION OF THE AREA WETTED BY DRIP IRRIGATION IN THE ARAVA DESERT,
Hebrew Univ., Rehovth (Israel).
For primary bibliographic entry see Field 3C.
W75-09445

IRRIGATION FOR BENCHES,
California Univ., Riverside.
T. Furuta, S. Besemer, W. C. Jones, R. Strohman, and T. Mock.
In: Proceedings of Second International Drip Irrigation Congress, p 149-154, (1974). 4 fig.

Descriptors: *Greenhouses, Irrigation, Horticultural crops, Agriculture.
Identifiers: *Drip irrigation, *Trickle irrigation, *Bench crop production.

Experiments were conducted on the modification of existing irrigation systems and the use of drip irrigation for crops grown in benches. Where the system was properly designed, excellent plant growth and yield resulted from the use of modified nozzle irrigation systems, and from the use of drip systems, both individual emitters and tubes with small orifices. As measured by plant performance, water was more uniformly distributed in the soil where drip or the modified nozzle system was used, compared to established irrigation systems. Even with soils amended with large volumes of organic matter, uniform distribution of water occurred, even though the surface between emitters was dry. Also excellent crops were produced in a soil that would be considered too tight or heavy for use in a bench. Considerable savings in the amount of water used and a corresponding reduction of the volume of run-off resulted. (See also W75-09423) (Skogerboe-Colorado State)
W75-09446

IRRIGATION FOR CONTAINER GROWING,
California Univ., Riverside.
T. Furuta, R. Branson, W. C. Jones, R. Strohman, and T. Mock.
In: Proceedings of the Second International Drip Irrigation Congress, p 155-158, (1974).

Descriptors: *Nutrients, *Root development irrigation, Greenhouses, Salinity.
Identifiers: *Trickle irrigation, *Drip irrigation, *Container growing, Microtubes.

Trickle irrigation and modifications have been used for container growing, especially under greenhouse conditions, for more than a decade. Microtubing has been generally used. Difficulties with uniform wetting of the entire soil mass had been encountered. This and other problems have limited the use of trickle irrigation. With the development of emitters for containers, it became possible to study the use of drip irrigation for container growing. Experiments were conducted to study the soil mixture-fertilization-irrigation subsystem. Larger plants--tops and roots--were noted under drip irrigation. These plants had higher N content initially and lower Na and Cl content late in the experiment. Root distribution within the container was also influenced with more roots in the center of the ball. Considerably less water was used with drip irrigation than with overhead sprinkling. The method of irrigation influenced salinity, nutrient content of drainage water and the wetting pattern in the soil. (See also W75-09423) (Skogerboe-Colorado State)
W75-09447

AUTOMATIC DRIP IRRIGATION FOR GREENHOUSE TOMATO PRODUCTION IN WEST TEXAS,
Texas A and M Univ., Lubbock.
L. New, and R. Roberts.
In: Proceedings of the Second International Drip Irrigation Congress, p 159-164, (1974). 1 fig.

Descriptors: *Crop production, *Tomatoes, *Automatic control, *Automation, Greenhouses, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Automatic irrigation.

Soil moisture sensors are used to automatically control the operation of drip irrigation systems and maintain optimum moisture levels in West Texas tomato greenhouses. Up to ten thousand square feet of growing area is being successfully irrigated by one sensor. Time clocks cause intermittent irrigation which helps prevent overwatering, puddling and runoff. Water flow control valves limit drip emitter water application rates to 1.0 to 1.5 gallons per hour. (See also W75-09423) (Skogerboe-Colorado State)
W75-09448

HIGH-FREQUENCY POROUS TUBE IRRIGATION FOR WATER-NUTRIENT MANAGEMENT IN HUMID REGIONS,
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation Research Center.
C. J. Phene.
In: Proceedings of the Second International Drip Irrigation Congress, p 166-171, (1974). 6 fig, 1 tab, 8 ref.

Descriptors: *Sweet corn, *Crop response, *Subsurface irrigation, Nitrogen, Automation, Irrigation efficiency, Nutrients, Furrow irrigation, Sprinkler irrigation, Irrigation practices, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation, *Porous tube irrigation.

A plastic porous tube and an electronic soil matric potential sensor supplied sweet corn with nutrients and water automatically by controlling the water content of a limited volume of root-zone soil. Sweet corn yield and water-use efficiency obtained with high-frequency porous tube irrigation systems were compared with those obtained from high-frequency sprinkler and furrow irrigation systems under similar irrigation control and fertility. In another experiment, sweet corn yield, plant nitrogen uptake, and soil (NO_3^-) movement were studied under controlled soil matric potential for various application rates of N and K. Ear yield with high-frequency porous tube irrigation was 10.5 and 12.6% greater than ear yield obtained with furrow and sprinkler irrigation, respectively. Water-use efficiency was 37 and 54% higher for sensor controlled high-frequency porous tube irrigation than for furrow and sprinkler irrigation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09449

CONTROL OF WATER BY DRIP IRRIGATION FOR ALFALFA SEED PRODUCTION,
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, R. Hageman, and A. W. Marsh.
In: Proceedings of the Second International Drip Irrigation Congress, p 172-177, (1974). 2 tab, 3 fig.

Descriptors: *Alfalfa, *Seeds, Crop response, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Drip irrigation controlled soil water tension treatments in an alfalfa seed production experiment resulted in a 4-fold yield difference between the best and poorest treatments. The experiment had 6 replications of 4 treatments and has been conducted for 2 years. Yield of forage as well as seed yields were determined. (See also W75-09423) (Skogerboe-Colorado State)
W75-09450

SEE GERMINATION RESPONSE TO SUBSURFACE IRRIGATION DEPTH,
Agricultural Research Service, Brawley, Calif.
For primary bibliographic entry see Field 2I.
W75-09451

TRAVELING TRICKLE SYSTEM,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
S. L. Rawlins, G. J. Hoffman, and S. C. Merrill.
In: Proceedings of the Second International Drip Irrigation Congress, p 184-187, (1974).

Descriptors: Irrigation design, Cost comparisons, *Cost analysis, Irrigation, Irrigation systems, *Irrigation practices, Agriculture, Sprinkler irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Traveling trickle systems, Row crop irrigation.

Typical drip irrigation systems deliver frequent applications of small volumes of water using a large number of small diameter orifices installed along tubes. The long lengths of tubes and large number of emitters required make drip irrigation costly for row crops. In addition, the small diameter of the orifices required to control water flow in such a system makes it susceptible to plugging and adds an additional filtration expense. A traveling trickle system is described that circumvents both of these problems by controlling water application with a few large orifices moved along the row rather than with a large number of fixed location orifices. Results are presented from cost analyses. (See also W75-09423) (Skogerboe-Colorado State)
W75-09452

MOBILE DRIP IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
O. C. Wilke.
In: Proceedings of the Second International Drip Irrigation Congress, p 188-192, (1974). 5 fig.

Descriptors: Irrigation design, Irrigation operation and maintenance, Irrigation practices, Irrigation, Agriculture, *Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation.

A tractor-mounted device for moving drip irrigation laterals is described. Time periods required to load, move and unload laterals are presented. Several drip irrigation trail lines were attached to a pivot sprinkler system. The design and performance of the system are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09453

FORMATION OF BLOCKAGES IN DRIP IRRIGATION SYSTEMS: THEIR PREVENTION AND REMOVAL,
Israel Center of Waterworks Appliances, Tel-Aviv.
D. Pelleg, N. Lahav, and D. Goldberg.

In: Proceedings of the Second International Drip Irrigation Congress, p 203-208, (1974). 8 fig, 3 tab, 6 ref.

Descriptors: *Clogging, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Clogging is one of the most severe problems associated with trickle irrigation systems. The different kinds of clogging are described along with the reasons for clogging. Methods of preventing clogging are given, and ways of cleaning systems after clogging has occurred are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09454

REVERSE FLUSHING TECHNIQUE FOR BI-WALL DRIP TUBING,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 8C.
W75-09455

CLOGGING OF DRIP SYSTEMS FROM METABOLIC PRODUCTS OF IRON AND SULFUR BACTERIA,
Agricultural Research and Education Center, Lake Alfred, Fla.
For primary bibliographic entry see Field 5B.
W75-09456

CHEMICAL TREATMENT OF DRIP IRRIGATION WATER,
Hawaiian Sugar Planters Association Experiment Station, Honolulu.
B. A. McElhoe, and H. W. Hilton.
In: Proceedings of the Second International Drip Irrigation Congress, p 215-220, (1974). 2 fig, 2 tab.

Descriptors: *Microorganisms, *Bacteria, Plugging, *Orifice flow, *Orifices, Irrigation, Agriculture, Irrigation efficiency, Irrigation systems, Irrigation water.
Identifiers: *Drip irrigation, *Trickle irrigation, *Chemical treatment.

Bacteria and other microorganisms in water are contributors to orifice plugging. Their skeletons, the slimes they produce, and their metabolic products are the glue that binds fine soil particles to the walls of the tube. Chemical treatment can arrest the agglomeration process and significantly reduce plugging. (See also W75-09423) (Skogerboe-Colorado State)
W75-09457

MOVEMENT OF WATER AND SALTS UNDER HIGH FREQUENCY IRRIGATION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
P. A. C. Raats.
In: Proceedings of the Second International Drip Irrigation Congress, p 222-227, (1974). 5 fig, 14 ref.

Descriptors: *Soil water movement, *Salinity, *Infiltration, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *High frequency irrigation.

Many modern irrigation systems deliver water at short intervals, in space as well as in time. Theoretical analyses show that the remaining variations are damped rapidly. Consequently, steady, one-dimensional movement and uptake is used as a basis for further analysis. Qualitative features of possible steady pressure head and water content profiles are discussed. Specific calculations for various leaching fractions and amounts of capillary rise from a water table are based on empirical, but realistic models for the dependence of the hydraulic conductivity upon the pressure head and for the spatial distribution of the rate of uptake. The resulting salinity profiles are also calculated. The results are compared with earlier, more approximate calculations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09458

LINEARIZED MOISTURE FLOW SOLUTIONS FOR POINT, LINE, AND STRIP SOURCES,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2G.
W75-09459

OPTIMUM LATERAL PLACEMENT FOR SUBSURFACE IRRIGATION SYSTEMS,
Minnesota Univ., St. Paul.
J. R. Gilley, and E. R. Allred.
In: Proceedings of the Second International Drip Irrigation Congress, p 234-239, (1974). 6 ref.

Descriptors: *Subsurface irrigation, *Mathematical models, *Irrigation design, Irrigation, Irrigation efficiency, Irrigation systems, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Design of a subsurface irrigation system requires both the proper placement of the lateral line in the soil profile and proper lateral discharge. The lateral placement depends on the nature of the soil-moisture movement from the applicator and the extraction pattern of the irrigated crop. The optimum location of the laterals will therefore vary with soil type and the crop being irrigated. A mathematical model describing soil-moisture movement during subsurface irrigation has been developed. The results of the portion of the model describing infiltration from the subsurface lateral compare quite favorably with data available in the literature. A series of one dimensional sinks, to simulate soil-moisture extraction by plants, has been combined with the infiltration model to obtain a model of soil-moisture movement during subsurface irrigation. The model was used to determine optimum lateral placement as a function of soil type and crop root zone depth to obtain the desired crop extraction patterns. Results of the model indicate the optimum lateral placements also have higher irrigation efficiencies than other placement values. These variables were used to develop design curves relating lateral depth, spacing and discharge to soil type and crop extraction pattern. Results also indicate that for proper design, lateral depth is more important than lateral spacing. (See also W75-09423) (Skogerboe-Colorado State)
W75-09460

TRICKLE IRRIGATION DESIGN FOR OPTIMAL SOIL WETTING,
Utah State Univ., Logan.
For primary bibliographic entry see Field 2G.
W75-09461

SOIL MOISTURE DISTRIBUTION AND WETTING PATTERN FROM A POINT SOURCE,
Arizona Univ., Yuma.
For primary bibliographic entry see Field 2G.
W75-09462

SOIL MOISTURE DISTRIBUTION AND DEPLETION IN AN APPLE ORCHARD IRRIGATED BY TRICKLERS,
Hebrew Univ., Rehovoth (Israel).
For primary bibliographic entry see Field 2G.
W75-09463

MOISTURE PROFILES AND SALINIZATION OF SOILS UNDER DRIP IRRIGATION IN THE REPUBLIC OF SOUTH AFRICA,
South Africa Dept. of Agricultural Technical Services, Pretoria.
For primary bibliographic entry see Field 3C.
W75-09464

AN EXPLANATION FOR THE GROWTH ADVANTAGE OF DRIP IRRIGATION,
New Mexico State Univ., University Park.
R. S. Freeburg, D. J. Cotter, and N. S. Urquhart.
In: Proceedings of the Second International Drip Irrigation Congress, p 265-270, (1974). 2 fig, 3 tab, 6 ref.

Descriptors: *Diurnal, *Temperature, *Soil temperature, *Furrow irrigation, *Sweet corn, *Crop response, Agriculture, Irrigation, Irrigation practices.
Identifiers: *Drip irrigation, *Trickle irrigation.

Soil, leaf, and air temperatures were measured for sweet corn during a 16-day period following emergence. The corn was grown in an experiment designed to compare trickle (drip) irrigation to furrow irrigation. There was significant differences between the temperature regimes produced by the two irrigation methods. The effects were especially notable in the soil temperatures. Based on a soil temperature of 80F which research literature indicates to be optimum for corn growth, an integrated deviation from optimum was computed for each irrigation method. Deviations above the optimum at the two-inch depth were only 785 degree-hours for the trickle system as compared to 1238 degree-hours for the furrow system during the 16-day period. During this period, the growth rate of the crop under furrow irrigation was 84 percent of that under the trickle irrigation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09465

TRICKLE IRRIGATION IN MICHIGAN ORCHARDS,
Michigan State Univ., Lansing.
C. D. Kesner, and A. L. Kenworthy.
In: Proceedings of the Second International Drip Irrigation Congress, p 272-274, (1974).

Descriptors: *Irrigation practices, Irrigation systems, *Michigan, Orchards.
Identifiers: *Trickle irrigation, *Drip irrigation, Microtubes.

The concept of trickle irrigation is being rapidly accepted by Michigan fruit growers. A major source of water is from small existing wells previously used for cooling sour (red tart) cherries at harvest time and other purposes. Lakes, ponds, rivers and creeks also serve as water sources. Pressure regulators or gate valves were originally used to control in-line pressure but the present trend is toward flow regulating valves in each row lateral. The primary emitter system in Michigan is the microtube with .025, .035, .036, or .045 inch I.D. tubes being the most popular. An illustrated presentation demonstrates the techniques used in many different installations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09466

TRICKLE IRRIGATION IN MICHIGAN ORCHARDS: CONTROLLING RATE OF FLOW WITH FLOW REGULATING VALVES AND MICROTUBES,
Michigan State Univ. Lansing.
For primary bibliographic entry see Field 8C.
W75-09467

DRIPPER FLOW CONSISTENCY,
Agricultural Research Service, Riverside, Calif.
S. Davis, and W. J. Pugh.
In: Proceedings of the Second International Drip Irrigation Congress, p 281-283, (1974). 6 fig.

Descriptors: *Flow characteristics, *Flow rates, *Application equipment, Equipment, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation.

Several different emitters have been checked for flow consistency volumetrically, both in time for the same emitter and for several emitters along the applicator line. Results of two years' study show many of the applicators vary more than plus or minus 5% from the average. With the exception of a few drippers that were partially clogged or improperly manufactured, most of the drippers provided consistent water distribution both along the line and with time. (See also W75-09423) (Skogerboe-Colorado State)
W75-09468

EVALUATION OF A TRICKLE IRRIGATION SYSTEM,
Technion - Israel Inst. of Tech., Haifa.
D. Karmeli, and J. Keller.
In: Proceedings of the Second International Drip Irrigation Congress, p 287-292, (1974). 1 tab.

Descriptors: *Uniformity, Soil moisture, *Evaluation, *Performance, Filtration, Irrigation practices, Irrigation efficiency, Irrigation operation and maintenance, *Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Emission uniformity, Design evaluation.

Factors determining performance of the system i.e. filtration quality, pressure and soil moisture distributions, are analyzed. Techniques for the evaluation of a system design or field performance are described and an equation to calculate the emission uniformity, EU, of a trickle system is presented. Results of field tests and design evaluations are summarized and criteria established. Relationships between EU and soil volume values as well as irrigation regimes (application rates and intervals) are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09469

HYDRAULICS OF SINGLE-CHAMBER VS. DUAL-CHAMBER TUBING,
Hawaiian Agronomics, Inc., Honolulu.
For primary bibliographic entry see Field 8C.
W75-09470

DESIGNING TRICKLE IRRIGATION LATERALS FOR UNIFORMITY,
Texas A and M Univ., College Station.
T. A. Howell, and E. A. Hiler.
In: Proceedings of the Second International Drip Irrigation Congress, p 299-304, (1974). 3 fig, 6 ref.

Descriptors: *Uniformity coefficient, *Uniform flow, *Irrigation design, Irrigation systems, Design criteria, Design flow, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Proper design of trickle irrigation laterals for desired uniformity is important to prevent under-irrigation, with resulting crop damage, or over-irrigation, with resulting water losses of drainage and runoff. Recently several papers have presented trickle irrigation design data and methods; yet a simple design equation for directly determining maximum lateral lengths for different lateral slopes, trickle emitter types, pipe sizes, and desired uniformity is not available. Design equations, based on standard principles, fluid mechanics, and graphs are presented which can be used to determine maximum trickle irrigation lateral lengths for selected uniformities. The maximum lateral length for a given uniformity is given as a power function (linear log-log) of either emitter spacing or number of emitters per lateral. Engineering design applications for this method are given in the form of specific examples. Implications and assumptions inherent in the method are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09471

DESIGN CHARTS FOR DRIP IRRIGATION SYSTEMS,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 8C.
W75-09472

HYDRAULIC AND MECHANICAL PROPERTIES OF DRIPPERS,
Israel Center of Water Works Appliances, Tel-Aviv.
For primary bibliographic entry see Field 8C.
W75-09473

EVALUATION OF HYDRAULICS OF FLOW THROUGH PIPES OF VARYING SLOPES, LENGTHS AND ORIFICE PLACEMENTS,
Udaipur Univ. (India).
For primary bibliographic entry see Field 8B.
W75-09474

PLANT WATER REQUIREMENTS AS RELATED TO TRICKLE IRRIGATION,
E. R. Hoare, K. V. Garzoli, and J. Blackwell.
In: Proceedings of the Second International Drip Irrigation Congress, p 323-328, (1974). 3 tab, 10 ref.

Descriptors: *Water requirements, *Irrigation systems, Irrigation design, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Trickle irrigation differs from spray and flood irrigation in that water is supplied in small amounts at frequent intervals in order to satisfy, as closely as possible, the plants' immediate needs. This is in contrast to other forms of irrigation in which large quantities of water are supplied, following which a gradual drying of the soil takes place, and subsequent irrigation is carried out to replenish the reservoir of soil moisture. The difference in these two approaches to irrigation means that current methods of estimating the water requirements of crops requires further evaluation. Not only does the water requirement vary with different climatic conditions, age of the plants and the season, irrespective of the method of irrigation, but the use of trickle irrigation imposes a further variation due to its particular effect on the soil-plant-atmosphere complex. The water requirements of plants under trickle irrigation are examined and ways are suggested in which these may be calculated from evaporation data, soil properties and other characteristics specific to the particular crop. Reference is also made to the use of trickle irrigation in particular situations, and how the water requirements in such cases can best be satisfied. (See also W75-09423) (Skogerboe-Colorado State)
W75-09475

DRIP AND FURROW IRRIGATION STUDIES ON SUGARCANE,
Texas A and M Univ., Weslaco. Agricultural Research and Extension Center.
C. J. Gerard.
In: Proceedings of the Second International Drip Irrigation Congress, p 329-331, (1974). 3 ref.

Descriptors: *Sugarcane, *Furrow irrigation, *Crop response, *Texas, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Research was conducted to evaluate the influences of drip and furrow irrigation on growth and yield of sugarcane in 1972 and 1973 in the Lower Rio Grande Valley of Texas. Drip irrigation treatments were 0, 25, 50, 75, and 100 and 0, 50, 75, 100 and 125% pan evaporation in 1972 and 1973, respectively. Yield of sugarcane was a linear function of applied water in 1972 with yields ranging from 35 to 51 tons per acre. Drip irrigation treatments are greater than or equal to 0.5 pan evaporation maintained rapid stalk elongation in early May and June in 1972. Rapid stalk elongation in July, August and September was maintained when the water applied was greater than or equal to 0.75 pan evaporation. Soil moisture, salinity conditions and root growth as influenced by treatments, emitter sites and soil depths were evaluated. These findings and their implications are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09476

SALINITY SENSOR CONTROL OF DRIP IRRIGATION WATER APPLICATION,
Agricultural Research Service, Brawley, Calif.
For primary bibliographic entry see Field 3C.
W75-09477

WATER USE WITH DRIP IRRIGATION,
California Univ., Parlier. San Joaquin Valley Agricultural Research and Extension Center.
F. K. Aljibury, A. W. Marsh, and J. Huntamer.
In: Proceedings of the Second International Drip Irrigation Congress, p 341-345, (1974).

Descriptors: *Evaporation pans, *Water requirements, Irrigation practices, Irrigation water, Irrigation system, Irrigation design, Frequency.
Identifiers: *Trickle irrigation, *Drip irrigation, San Joaquin Valley(California).

In the absence of proper equations to calculate water requirements with drip irrigation, irrigation consultants and dealers in California have used the same water use data developed for conventional irrigation systems. Since one of the primary advantages of drip irrigation is water savings, development of water budget to fit drip irrigation became necessary. To accomplish this objective, several drip irrigation studies were initiated in the San Joaquin Valley of California. These studies were conducted on farms where citrus, avocados, plums, olives, and grapes were grown. Applied water was measured using flow meters while the frequency and amount of water application was determined with tensiometers which were set to switch the water on at 30 centibars. Water evaporation from Class A pans established in large alfalfa fields was recorded regularly. A table is presented showing suggested drip water application as a function of Class A pan evaporation and percent plant coverage. (See also W75-09423) (Skogerboe-Colorado State)
W75-09478

WATER USE BY DRIP AND SPRINKLE IRRIGATED AVOCADOS RELATED TO PLANT COVER, EVAPORATION AND AIR TEMPERATURE,
California Univ., Riverside.
A. W. Marsh, C. D. Gustafson, S. Davis, R. L. Branson, and R. A. Strohman.
In: Proceedings of the Second International Drip Irrigation Congress, p 346-350, (1974). 2 tab, 5 ref.

Descriptors: *Consumptive use, *Sprinkler irrigation, *Air temperature, *Evaporation, Tensiometers, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Avocado, Plant cover, *Trickle irrigation, *Drip irrigation.

Water application to the avocados has been closely controlled by relating it to tensiometer readings. A sufficiency has been maintained while limiting excesses. In 1973, the drip irrigation applications have been automatically controlled by electrified tensiometers that provide signals for a controller. The measured applications are thought to represent the actual water requirement for each irrigation system as closely as it can be determined. The correlation of measured water use to evaporation from a class A pan is shown for each irrigation method as influenced by varying air temperature, percentages of plant cover, and period of the year. (See also W75-09423) (Skogerboe-Colorado State)
W75-09479

TRICKLE IRRIGATION MANAGEMENT FOR COTTON AND CABBAGE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. A. Bucks, L. J. Erie, and O. F. French.
In: Proceedings of the Second International Drip Irrigation Congress, p 351-356, (1974). 5 fig, 4 ref.

Descriptors: *Cotton, *Frequency, *Consumptive use, *Water utilization, Agriculture, Irrigation, Furrow irrigation, Comparative productivity, Crop response.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cabbage.

Cotton and cabbage studies were initiated to evaluate the effects on crop production of specified quantities and frequencies of water applications using trickle irrigation. Different quantities of irrigation water were applied at frequencies of 3, 6, and 12 days. Both studies were conducted on small plots of fine-textured, clay-loam soil, using a moderately saline water. Results of these studies indicate the following: (1) the amount of soil moisture needed by the cotton and cabbage plants for high production was approximately the same as the presently-accepted consumptive use; (2) increasing frequency of trickle to 3 days did not increase yields on this soil; and (3) trickle irrigation can decrease irrigation water requirements under conditions where furrow irrigation would not attain a high overall irrigation efficiency. (See also W75-09423) (Skogerboe-Colorado State)
W75-09480

SOIL SALINITY DISTRIBUTION IN DRIP AND SUBSURFACE IRRIGATED SUMMER SQUASH,
Agricultural Research Service, Riverside, Calif.
For primary bibliographic entry see Field 3C.
W75-09481

MONITORING SOIL SALINITY AND LEAF NUTRIENT LEVELS IN A YOUNG AVOCADO ORCHARD UNDER DRIP IRRIGATION,
California Univ., Riverside.
R. L. Branson, C. D. Gustafson, A. W. Marsh, S. Davis, and R. A. Strohman.
In: Proceedings of the Second International Drip Irrigation Congress, p 364-367, (1974). 2 tab, 5 ref.

Descriptors: *Salinity, *Monitoring, *Orchards, *Leaching, *Nutrients, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Avocados.

Salinity control is an important part of the management program for avocado production because of this crop's low tolerance to salts. Soil salinity in the root zone of a newly planted avocado orchard was monitored for four years. The orchard, located in a semi-arid region of southern California, is irrigated with a moderately saline water from the Colorado River. Soil salinity rose to marginal levels during each irrigation season under both irrigation methods. Winter rainfall, however, leached accumulated salts from the soil each year. Distribution of the rainfall, as well as total amount, was an important factor with regard to adequacy of leaching. Leaf samples were analyzed annually to obtain information on the uptake of chloride, an ion toxic to avocado at relatively low levels. Leaf analysis data are also being used to evaluate the fertilization program. (See also W75-09423) (Skogerboe-Colorado State)
W75-09482

AFFORESTATION WITH SALINE WATER IN ABU DHABI,
Ministry of Agriculture, Abu Dhabi (United Arab Emirates).
For primary bibliographic entry see Field 3C.
W75-09483

SALINITY MANAGEMENT FOR HIGH FREQUENCY IRRIGATION,
Agricultural Research Service, Riverside, Calif.
For primary bibliographic entry see Field 3C.
W75-09484

IRRIGATION RETURN FLOW AS INFLUENCED BY DRIP IRRIGATION,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 5G.
W75-09485

AN INVESTIGATION INTO THE POTENTIAL USES OF TRICKLE IRRIGATION FOR DESERT RECLAMATION AND FODDER PRODUCTION IN THE EMIRATE OF ABU DHABI,
Agricultural Planning Associates Ltd., London (England).
For primary bibliographic entry see Field 4A.
W75-09487

EFFECTS OF LOCALIZED PHOSPHATE TREATMENTS AND SOLUTION PH ON THE GROWTH AND FUNCTION OF APPLE ROOTS,
Victoria Dept. of Agriculture, Ferntree Gully (Australia). Scoresby Horticultural Research Station.
For primary bibliographic entry see Field 3C.
W75-09488

APPLICATION OF FERTILIZER THROUGH DRIP IRRIGATION SYSTEMS IN WEST TEXAS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
K. E. Lindsey, and L. L. New.
In: Proceedings of the Second International Drip Irrigation Congress, p 400-404, (1974).

Descriptors: *Fertilization, *Pecans, Irrigation systems, Zinc, Crop response, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Zinc chelate.

Zinc chelate applications to pecan trees were made through several types of systems on several soil types. Comparisons were made with customary spray applications of Zn. Effectiveness of applications was measured by leaf analysis and trunk growth measurements. Examination of the effectiveness of several of the injection systems was done by analyzing water emitted at timed intervals after injection of Zn materials. (See also W75-09423) (Skogerboe-Colorado State)
W75-09489

INVESTIGATIONS IN SUGARCANE FERTILIZATION BY DRIP IRRIGATION IN HAWAII,
Hawaiian Sugar Planters Association Experiment Station, Honolulu.
M. Isobe.
In: Proceedings of the Second International Drip Irrigation Congress, p 405-410, (1974). 3 tab.

Descriptors: *Sugarcane, *Fertilization, *Hawaii, Nitrogen, Subsurface irrigation, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Aqua ammonia.

Research was initiated in Hawaii to determine efficient ways to fertilize sugarcane under drip irrigation. Paper reports on improvement of fertilizer efficiency and the use of aqua ammonia, the cheapest source of nitrogen available on the market. (See also W75-09423) (Skogerboe-Colorado State)
W75-09490

FERTILIZER APPLICATIONS WITH DRIP IRRIGATION,
Agriplas Limited (South Africa).
H. L. Grobbelaar, and F. Lourens.
In: Proceedings of the Second International Drip Irrigation Congress, p 411-415, (1974). 3 tab.

Descriptors: *Fertilization, *Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

It has been found that the application of fertilizer mixtures through a drip irrigation system is not only feasible, but can be very beneficial. Fertilizer mixtures must not cause blockage, must be water soluble, must leave no residue in the fertilizer dispenser, and must be easy to handle. (See also W75-09423) (Skogerboe-Colorado State)
W75-09491

USE OF GLYCEROPHOSPHATE FOR FERTILIZATION THROUGH TRICKLE IRRIGATION SYSTEMS,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W75-09492

WEED CONTROL UNDER DRIP IRRIGATION IN ORCHARD AND VINEYARD CROPS,
A. Lange, F. Aljibury, B. Fischer, W. Humprey, and H. Otto.
In: Proceedings of the Second International Drip Irrigation Congress, p 422-424, (1974).

Descriptors: *Herbicides, Orchards, Irrigation practices, Irrigation, Agriculture, *Weed control.
Identifiers: *Trickle irrigation, *Drip irrigation, Vineyards.

Conventional herbicide applications in orchards and vineyards under drip irrigation have been somewhat unsuccessful. Annual applications of most herbicides have broken down in the moist area close to the dripper leaving a vigorous small circle of weed growth by summer. Herbicides differ in their rates of breakdown under drip irrigation when compared to furrow and sprinkler. Atrazine showed the greatest response to breakdown under continuously wet soils. Napropamide was affected least by wet soils. Trifluralin, profluralin, and norflurazon were intermediate. Numerous herbicide treatments have been evaluated under drip irrigation. The results of several of these are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09493

INFLUENCE OF DIFFERENT AMOUNTS OF IRRIGATION--WATER, IRRIGATION--INTERVALS AND FERTILIZERS ON THE YIELD AND QUANTITY OF DRIP-IRRIGATED MUSK-AND WATERMELONS,
Ministry of Agriculture, Beisan (Israel).
C. Dan.
In: Proceedings of the Second International Drip Irrigation Congress, p 425-430, (1974). 8 tab.

Descriptors: *Melons, *Fertilization, *Crop response, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation.

Trials were initiated to determine irrigation and fertilization practices to promote high muskmelon and watermelon yields of satisfactory quality. Yields were not affected by different amounts of irrigation water or by different irrigation schedules. (See also W75-09423) (Skogerboe-Colorado State)
W75-09494

WATER UPTAKE BY AN APPLE TREE WITH VARIOUS PROPORTIONS OF THE ROOT SYSTEM SUPPLIED WITH WATER,
Victoria Dept. of Agriculture, Ferntree Gully (Australia).

J. D. F. Black, and D. W. West.
In: Proceedings of the Second International Drip Irrigation Congress, p 432-433, (1974). 1 fig, 1 tab.

Descriptors: *Apple, *Root development, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, Water uptake.

Water uptake by young apple trees with 1/4, 1/2, and 3/4 of their root systems supplied with water was related to the uptake with the total system supplied with water in a split root pot trial. The respective percentages of water uptake compared with the totally watered system were 74, 88, and 94 percent. (See also W75-09423) (Skogerboe-Colorado State)
W75-09495

EFFECTS OF NITROGEN FERTILIZER APPLICATIONS TO PART OF A ROOT SYSTEM,
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
G. J. T. Frith, and D. G. Nichols.
In: Proceedings of the Second International Drip Irrigation Congress, p 434-436, (1974). 1 tab.

Descriptors: *Nitrogen, *Fertilization, *Apples, *Root systems, Orchards, Irrigation, Agriculture, Irrigation water.
Identifiers: *Trickle irrigation, *Drip irrigation.

It is usual under trickle irrigation of mature fruit trees to have considerably less than the total root volume wetted. If satisfactory nutrition of these trees is to be achieved with fertilizer dissolved in the irrigation water, then the wetted roots must increase their efficiency of nutrient uptake in a manner similar to their increased water uptake. Trials with split root seedling apple trees grown in water culture has shown that the nitrogen uptake efficiency of roots is increased as the proportion of the root system supplied with nitrate nitrogen is decreased. The efficiency of water uptake from those parts of the root system supplied with nitrate nitrogen was also increased over the level of uptake in quarters without nutrients. (See also W75-09423) (Skogerboe-Colorado State)
W75-09496

CHANGE IN ROOT DISTRIBUTION OF MATURE PEAR TREES IN RESPONSE TO TRICKLE IRRIGATION,
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
J. D. F. Black, and P. O. Mitchell.
In: Proceedings of the Second International Drip Irrigation Congress, p 437-438, (1974).

Descriptors: *Root distribution, *Root development, Irrigation, Agriculture, Orchards.
Identifiers: *Trickle irrigation, *Drip irrigation, Pears.

Work reported was designed to obtain an idea of the rate of adaption of the root distribution of pear trees grown under uniform sprinkler irrigation for 18 years and then converted to trickle irrigation for two years with one emitter per tree. Flow rate per emitter was 8 1 per hour per tree. After two seasons the entire root system of 4 trees was exposed and examined for changes in response to the continuously moist but restricted wetted soil volume in the root zone. The intensity of new root growth was markedly higher inside the wetted soil volume. (See also W75-09423) (Skogerboe-Colorado State)
W75-09497

CHANGES IN ROOT PATTERNS OF PEACH TREES UNDER TRICKLE IRRIGATION,
Victoria Dept. of Agriculture (Australia).
For primary bibliographic entry see Field 2I.
W75-09498

DRIP IRRIGATION EXPERIMENT ON AVOCADOS,
California Univ., San Diego, La Jolla.
For primary bibliographic entry see Field 3C.
W75-09499

EFFECTS OF DRIP IRRIGATION ON SOIL-WATER-PLANT RELATIONSHIP,
Sao Paulo Univ. (Brazil). Escola Superior de Agricultura Luiz de Queiroz.
For primary bibliographic entry see Field 2I.
W75-09500

TRICKLE IRRIGATION ON YOUNG PEACH TREES,
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
P. D. Mitchell, and J. D. F. Black.
In: Proceedings of the Second International Drip Irrigation Congress, p 452-455, (1974). 8 fig.

Descriptors: *Peaches, *Crop response, *Growth rates, Root distribution, Evaporation, Orchards, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Two field trails on young peach trees are described. Trial A. The effects of supplying 9, 18, 36, or 72 1 of water per day to newly planted peach trees regardless of rainfall and evaporation demonstrate that these factors cannot be ignored in soils of imperfect drainage. Trees died under the highest rate, were severely damaged at the second highest rate, showed some root damage under the second lowest rate but grew better at this rate than at the lowest rate. Trial B. Growth of peach trees trickle irrigated daily or after 2.5 or 5 cm net evaporation intervals are compared. Response was less at the 5 cm interval than at the 2.5 cm or daily intervals. Root density in the wetted root zone was highest under the daily interval and least under the 5 cm interval. A significant linear relationship is established between trunk area increase and water applied per unit of trunk area per unit of evaporation. The treatment limit in this trial of 2.5 1 per sq. cm. trunk area per cm evaporation is to be extended in further trials. (See also W75-09423) (Skogerboe-Colorado State)
W75-09501

DRIP IRRIGATION IN CITRUS ORCHARDS,
Ministry of Agriculture, Beisan (Israel).
E. Yagev, and Y. Choresh.
In: Proceedings of the Second International Drip Irrigation Congress, p 456-461, (1974). 2 fig, 7 tab.

Descriptors: *Oranges, *Crop response, Root development, Salinity, Saline soils, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

In a Valencia orange grove grafted onto sour orange root stock, drip irrigation treatments of one and two laterals per row of trees at semi-weekly and bi-weekly intervals was compared to the standard treatment of sprinkler irrigation. The water application to all treatments was based on identical daily rates. The factors checked were salt accumulation and moisture distribution pattern in the soil profile, root development, mineral content of leaves, weight of yield and number of fruit per tree, and fruit quality. There was no difference in yield and fruit quality between the treatments checked. The average salt accumulation in the soil was less with the drip irrigation treatments than with the sprinkler irrigation. The soil moisture tension below the drip lateral was low all the time and there is reason to believe that there is a loss of water below the root zone. There was no significant difference in root development between all the treatments. (See also W75-09423) (Skogerboe-Colorado State)
W75-09502

AN INVESTIGATION ON THE USE OF DRIP IRRIGATION FOR THE ESTABLISHMENT OF MULTI-PURPOSE PARKS (GREEN BELTS AROUND THE CITIES) IN IRAN,
Research Inst. of Forests and Rangelands, Tehran (Iran).
P. Mehdizadeh, and S. Tamaddoni-Jahromi.
In: Proceedings of the Second International Drip Irrigation Congress, p 462-467, (1974). 5 fig, 2 tab.

Descriptors: *Furrow irrigation, Crop response, *Parks, Irrigation, Irrigation systems, Irrigation practices, Forestry, Forests, Forest management.
Identifiers: *Trickle irrigation, *Drip irrigation, *Greenbelts, *Iran.

Paper deals with the application of a 'home-made' drip irrigation system in a multipurpose forest park near Tehran. The study was initiated as a pilot trial to determine: (1) if drip irrigation should be considered for irrigating forest species in the parks and green belts of Iran, (2) plant responses to drip irrigation of green belts, and (3) possible water savings. Although some suppression of height growth was found, seedlings remained healthy. The amount of irrigation water used was reduced by 85% as compared to the furrow irrigation system used previously. (See also W75-09423) (Skogerboe-Colorado State)
W75-09503

TREE AND CROP RESPONSE TO DRIP IRRIGATION,
Washington State Univ., Prosser.
J. E. Middleton, E. L. Proebsting, S. Roberts, and F. H. Emerson.
In: Proceedings of the Second International Drip Irrigation Congress, p 468-473, (1974). 5 fig, 3 tab, 3 ref.

Descriptors: *Orchards, *Crop response, *Fruit crops, Salinity, Irrigation system, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Prunes.

Bearing 'Early Italian' prune trees performed normally with 60 and 80 gallons per tree per day using continuous drip irrigation. With 20 and 40 gallons per tree per day the fruit was smaller, better colored and earlier with higher soluble solids. In the second year, the two lower rates greatly reduced bearing surface and yields. Leaf moisture data indicated no difference in the four quadrants of the tree when all water was applied at one point. Twelve hour daily applications were compared to continuous applications the second year. There were some soluble salts in the non-saline soil which were reduced measurably by movement away from the center of the drip area as the season progressed. Soil moisture movement was recorded. Growth response of first year apple trees to drip and sprinkler irrigation at comparative application frequencies and amounts was similar. (See also W75-09423) (Skogerboe-Colorado State)
W75-09504

CANTALOUPE RESPONSE TO DRIP IRRIGATION,
Agricultural Research Service, Brawley, Calif.
L. S. Willardson, G. W. Bohn, and M. J. Huber.
In: Proceedings of the Second International Drip Irrigation Congress, p 474-479, (1974). 3 tab.

Descriptors: *Root distribution, *Crop response, *Furrow irrigation, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cantaloupe.

Changes in rooting pattern may change nutrition and plant response, and thus alter desirable characteristics of plants. Five experiments conducted included nine cantaloupe cultivars grown on silty clay loam with drip and furrow irrigation

systems. The different irrigation management practices followed have resulted in variable plant responses. (See also W75-09423) (Skogerboe-Colorado State)
W75-09505

STAKED TOMATO DRIP IRRIGATION IN CALIFORNIA,
California Univ., San Diego, La Jolla.
B. J. Hall.
In: Proceedings of the Second International Drip Irrigation Congress, p 480-486, (1974). 6 tab, 6 ref.

Descriptors: *Tomatoes, Furrow irrigation, Irrigation systems, Irrigation practices, Crop response, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Six staked tomato drip irrigated field trials, where properly grown, resulted in slightly higher yields and appreciable water savings, compared to furrow applications. Drip irrigation supplied water more uniformly which resulted in more even plant growth. Cultural operations can be carried out in the drip irrigated crops at any time, while close coordination of these operations is essential when using furrow or sprinkler irrigations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09506

SPRING CUCUMBER DRIP VS. FURROW IRRIGATION,
California Univ., San Diego, La Jolla.
B. J. Hall.
In: Proceedings of the Second International Drip Irrigation Congress, p 486-490, (1974). 1 tab, 6 ref.

Descriptors: *Fertilization, *Furrow irrigation, *Crop response, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Cucumbers.

Two field trials conducted on the early spring cucumbers started and grown in plastic row covers indicate that drip irrigation can successfully produce good yields. Less water can be used in producing as high or better yields with drip irrigation. Slow release fertilizer resulted in good yields, yet the plants appeared to run short during the last two or three weeks. Placing the drip line in the bottom of a 1 1/2 to 2-inch narrow furrow appeared to reduce the mature fruit pressure on the drip lines in bush culture. (See also W75-09423) (Skogerboe-Colorado State)
W75-09507

THE IRRIGATION OF OLIVES BY DRIP AND OTHER IRRIGATION METHODS,
Ministry of Agriculture, Beisan (Israel).
C. Dan.
In: Proceedings of the Second International Drip Irrigation Congress, p 491-496, (1974). 4 tab.

Descriptors: *Crop response, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Olives.

Drip irrigated young trees have higher and earlier yields before attaining full maturity, than trees irrigated by any other method. The number of emitters per tree was not found to be critical in the range of 4 to 8 emitters per tree. The yields of mature trees which were converted to trickle irrigation were generally somewhat higher than before. (See also W75-09423) (Skogerboe-Colorado State)
W75-09508

PERFORMANCE OF PLANTS WITH DRIP IRRIGATION,
California Univ., Parlier. San Joaquin Valley Agricultural Research and Extension Center.
F. K. Aljibury, M. Gerdts, A. Lange, J. Huntamer, and G. Leavitt.
In: Proceedings of the Second International Drip Irrigation Congress, p 497-502, (1974). 2 fig, 3 tab, 3 ref.

Descriptors: *Oranges, *Water utilization, *Crop response, Penetration, Furrow irrigation, Crop production, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Plums, *Drip irrigation, *Trickle irrigation.

Experiments were established to study the effect of drip irrigation on water use efficiency and production in oranges and to study the effect of drip and furrow irrigation on water penetration and performance of plums. Orange production records show higher production with drip irrigation which is attributed to improved water penetration. Plum production records show no significant difference in production or fruit quality, but irrigation efficiency was improved. (See also W75-09423) (Skogerboe-Colorado State)
W75-09509

TRICKLE IRRIGATION MANAGEMENT FOR GRAPES,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. A. Bucks, L. J. Erie, F. S. Nakavama, and O. F. French.
In: Proceedings of the Second International Drip Irrigation Congress, p 503-507, (1974). 3 fig, 1 tab, 3 ref.

Descriptors: *Crop response, Agriculture, Irrigation, Consumptive use, Furrow irrigation, Frequency, Water utilization, Irrigation design, Irrigation practices, Water requirements.
Identifiers: *Trickle irrigation, *Drip irrigation, *Grapes.

A three-year field investigation is being conducted to determine irrigation management and design requirements for grape production. Trickle irrigation treatments include three irrigation quantities, based on ratios of a consumptive-use estimate; three irrigation frequencies--daily, 3-day and 6-day; and a variation of one or two trickle irrigation emitters per vine. Furrow irrigation treatments include the same three seasonal quantities used for the trickle irrigation applied in two or three furrows per vine; however, the irrigation frequency is varied, based on the consumptive use. First-year results were as follows: there was a 13 percent increase in yield for trickle irrigation with two emitters per vine over furrow irrigation; a 9 percent greater yield for two emitters over one emitter per vine; a 6 percent increase in berry size for trickle-irrigated fruit over furrow-irrigated; little difference in sugar content between irrigation treatments; and little difference in yield between trickle irrigation frequencies. (See also W75-09423) (Skogerboe-Colorado State)
W75-09510

A STUDY ON DIFFERENT APPLICATION PROCEDURES OF DRIP IRRIGATION IN TOMATO CULTIVATION,
F. T. Noyola.
In: Proceedings of the Second International Drip Irrigation Congress, p 508-511, (1974).

Descriptors: *Tomatoes, *Crop production, *Crop response, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Discussed are results of a study on tomatoes to determine reasonable application procedures of drip irrigation water. (See also W75-09423) (Skogerboe-Colorado State)
W75-09511

THE RELATION BETWEEN DRIP IRRIGATION, PHYTOPHTHORA ROOT ROT OF AVOCADO, AND FUNGICIDES,
California Univ., Riverside.
For primary bibliographic entry see Field 2I.
W75-09512

DRIP VS. FURROW IRRIGATION TRIALS IN POTATO UNDER SUBTROPICAL CONDITIONS,
Punjab Agricultural Univ., Ludhiana (India).
N. T. Singh, S. S. Grewal, and A. S. Josan.
In: Proceedings of the Second International Drip Irrigation Congress, p 515-520, (1974) 1 fig, 2 tab, 17 ref.

Descriptors: *Potatoes, Crop response, Soil temperature, *Subtropic, *Furrow irrigation, Irrigation systems, Irrigation practices, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

The drip method of irrigation was compared with conventional furrow irrigation in field grown spring and autumn potatoes. Treatments included irrigations at 0.25, 0.50, and 0.75 bar soil moisture tension at 10 cm depth and drip irrigation. As an average of six crops, for equal amounts of water used drip irrigation gave 60 q/ha or 31% higher yield than irrigation at 0.25 bar soil moisture tension. Irrigation at 0.50 and 0.75 bar tension yielded significantly lower than these treatments. Wetter soil moisture regimes lowered the maximum soil temperature at 10 cm depth by 1 to 3.5C thereby bringing it closer to the optimum required by the crop. Effect of soil moisture on soil temperature and soil strength was isolated using organic mulches. Soil temperature appeared to be a critical factor in improving yield and quality of potatoes. Drip irrigation promises a more suitable soil moisture and soil temperature regime for potato cultivation in the subtropics. (See also W75-09423) (Skogerboe-Colorado State)
W75-09513

RESPONSE OF MATURE CITRUS TREES ON DEEP SANDY SOIL TO DRIP IRRIGATION,
South Australia Dept. of Agriculture, Adelaide.
P. J. Cole, and M. R. Till.
In: Proceedings of the Second International Drip Irrigation Congress, p 521-526, (1974). 1 fig, 4 tab, 1 ref.

Descriptors: *Oranges, *Crop response, Agriculture, Irrigation, Management orchards, Salinity, Irrigation design, Irrigation practices, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation.

A demonstration trial on mature vallencia oranges was established to provide guidelines for future drip irrigation management in Australia. The trees are on a deep sandy soil and were established and previously maintained by sprinkler irrigation. There may be up to 450 mg/l total dissolved salts in the irrigation water. Two designs of drip irrigation have been used - one with a row of drippers along the base of the trees only, and the other with a line along both the base and in midrow. There are twice the number of drippers in this latter system, each of half the flow rate of the former. A difference in the performance of trees are yielding less than sprinkler irrigated trees, with double line drip irrigation better than single line drip irrigation. (See also W75-09423) (Skogerboe-Colorado State)
W75-09514

BIOPHYSICAL CONTROL OF WATER LOSS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
C. Y. Sullivan, J. D. Eastin, E. J. Kinbacher, W. M. Ross, and L. D. Dunkte.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 505, $3.75 in paper copy, $2.25 in microfiche. Completion Report, 1975. 39 p, 7 ref. OWRT A-026-NEB(3). 14-31-0001-5027.

Descriptors: *Water loss, Water utilization, Sorghum, *Corn(Field), Biocontrol, *Stomata, Farm management, *Drought tolerance, *Heat resistance, Plant physiology.
Identifiers: Plant breeding, *Biophysical control, *Sorghum genotypes.

This project investigated the plant's part in controlling water loss from cropping systems primarily in dryland agriculture but also with application to irrigated conditions. Emphasis was placed on differences in corn and sorghum in mechanisms involved in water loss and differences between sorghum genotypes. Stomatal closure is a primary mechanism for control of water loss. Stomatal response was evaluated by water vapor diffusive resistance and by microscopic observations of stomatal imprints. Corn stomata closed sooner than those of sorghum when water deficits occurred. A method of screening for desiccation and heat tolerance was developed and used in selecting sorghum genotypes. The test involves curring leaf discs, exposing them to controlled stress and evaluating cellular membrane injury by measuring leakage of electrolytes from the cells. Corn generally was higher cellular tolerance to both heat and desiccation. Plants could be selected for heat and drought tolerance. Hybrids made from selected tolerant lines had a significantly positive correlation between heat tolerance measured during drought and high temperature stress periods and yield in 1974. Heat and desiccation were positively correlated in tests with greenhouse grown plants.
W75-09523

GROWTH OF BARLEY IRRIGATED WITH WASTEWATER SLUDGE CONTAINING PHOSPHATE PRECIPITANTS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09543

UTILIZATION OF DIGESTED CHEMICAL SEWAGE SLUDGES ON AGRICULTURAL LANDS IN ONTARIO,
Ontario Ministry of the Environment, Toronto.
S. A. Black.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 107-113, 1974. 1 fig, 2 tab, 3 ref, 1 append.

Descriptors: *Sludge disposal, Canada, Agriculture, Metals, Nitrogen, Phosphorus, Waste disposal, Land use, Sewage sludge, Waste water treatment, Sludge treatment.
Identifiers: *Land application, Sanitary landfills.

The most common method of sludge disposal currently utilized in Ontario, Canada is anaerobic digesting followed by dumping into sanitary landfills or disposal onto farmers' fields. While land application is frequently used, it is looked upon as a disposal practice rather than as a type of fertilizer. The agricultural value of sludge is discussed, as well as possible hazards due to the leaching of heavy metals. Ontario has had a phosphorus removal program which will seriously affect 150 of its treatment facilities by the end of 1975. About 85 percent of Ontario's sewage treatment plants will practice phosphorus removal by that time. More consideration is being given the benefit and hazards involved with the sludge contained nutrients, heavy metals, long chain organics, and microorganisms on soils, crops, groundwater, and surface waters. Guidelines have been prepared for the utilization of processed organic waste by land application. These assume that organic waste has been processed by anaerobic or aerobic digestion or other suitable processing at a municipal water pollution control plant and that land application is defined as utilizing the waste for agriculture, not merely disposing of the sludge. Requirements for the site location, land characteristics, site management, waste application rates, and waste handling and spreading equipment are detailed. (See also W75-09532) (Prague-FIRL)
W75-09544

IMPROVING THE DESIGN OF PRACTICAL FIELD DRAINAGE,
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
For primary bibliographic entry see Field 4A.
W75-09595

SIMULATION OF MISCIBLE DISPLACEMENT IN SOILS USING THE METHOD OF CHARACTERISTICS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-09612

WATER LAWS IN MOSLEM COUNTRIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 6E.
W75-09625

DRAINAGE MATERIALS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
For primary bibliographic entry see Field 8G.
W75-09628

SURVEY OF EXPERIENCE WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Rijksstation voor Landbouwtechniek, Merelbeke (Belgium).
For primary bibliographic entry see Field 8G.
W75-09629

STUDY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF SPECIFICATIONS AVAILABLE IN FRANCE,
Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forets et l'Equipment Rural, Antony (France).
For primary bibliographic entry see Field 8G.
W75-09630

EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Kuratorium fuer Kulturbauwesen, Hanover (West Germany).
For primary bibliographic entry see Field 8G.
W75-09631

A SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Vizgazdalkodasi Tudomanyos Kutato Intezet, Budapest (Hungary).
For primary bibliographic entry see Field 8G.
W75-09632

DRAINAGE MATERIALS - PROVISIONAL REPORT OF THE EXPERIENCE GAINED IN THE NETHERLANDS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 8G.
W75-09633

SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Ministry of Agriculture, Fisheries and Food, Cambridge (England).
For primary bibliographic entry see Field 8G.
W75-09634

INDEX 1945-1966, LAND AND WATER.
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
For primary bibliographic entry see Field 10C.
W75-09635

WATER FOR AGRICULTURE, ANNOTATED BIBLIOGRAPHY, AUTHOR AND SUBJECT INDEX.
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
For primary bibliographic entry see Field 10C.
W75-09636

IRRIGATING APPARATUS,
H. C. Bennett.
US Patent No 3,880,189, 3 p, 4 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 2043, April 29, 1975.

Descriptors: *Patents, *Irrigation systems, *Irrigation efficiency, Irrigation operation and maintenance, *Valves, Flow control.
Identifiers: Flow control valves.

The invention relates to an irrigating system having improved flow-control valves. The irrigating system includes a large supply manifold from which a plurality of outlet pipes extend transversely at suitable intervals. A valve is located in each outlet pipe to individually control flow of water. The valve has a shaft extending through the outlet pipe with a transverse elongate handle which can be manipulated by an operator by means of a T-wrench. Consequently, the operator can walk along the manifold and individually manipulate each valve of each outlet pipe to obtain the desired flow without stooping. This not only substantially reduces the amount of time involved but also the amount of fatigue. The transverse handles are located both above and below the outlet pipes. The outlet pipes can extend from either side of the manifold with handles being above the outlet pipes and readily accessible in all instances. The valve includes a valve body of circular configuation having a resilient outer surface which enables the body to conform with and seal the transverse outlet pipe in which it is located. (Sinha-OEIS)
W75-09641

DEVICE FOR DISTRIBUTING IRRIGATION WATER,
M. L. King.
US Patent No 3,884,416, 4 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1064, May 20, 1975.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Application equipment, *Water distribution(Applied), Irrigation design, *Irrigation systems.
Identifiers: Water distribution patterns.

A device is provided for the distribution of irrigation water which comprises a body for the support of a vertical shaft, a sprinkler head affixed to the shaft and means for deriving rotational motion of the sprinkler head from the internal energy of the irrigation water passing through it. The sprinkler head is provided with a primary orifice and a secondary orifice, with the secondary orifice so aligned that the water-jet issuing from it intercepts the deflecting vane and initiates rotary motion of the vane-arm relative to the sprinkler head. The unbalanced torques resulting from the intermittant action of the secondary water jet on the vane and

from the elastic restraint of the vane-arm propel the sprinkler head into unidirectional rotary motion about its shaft. Water is conveyed through a hollow bore in the shaft through a port plate rigidly affixed to the base, and the port plate is provided with a central port and at least one radially offset port. By varying the size, shape, number and angular location of the orifices in the orifice plate, the irrigation pattern of the sprinkler may be adjusted to any arbitrary shape. (Sinha-OEIS)
W75-09662

CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5B.
W75-09719

HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W75-09722

THE SAHELIAN DROUGHT - A DISASTER FOR LIVESTOCK POPULATIONS,
Food and Agricultural Organization of the United Nations, Rome (Italy). Animal Production and Health Div.
R. S. Temple, and M. E. R. Thomas.
World Animal Review, No 8, p 1-7, 1973. 8 fig, 3 tab.

Descriptors: *Droughts, Damages, *Livestock, *Arid climates, *Recharge, *Aquifers, Grazing.
Identifiers: *Sahelian zone.

During late 1972 and early 1973, the Sahelian zone of Africa was suffering one of its worst droughts in memory. Reports by FAO/UNDP task forces working on the Sahelian drought situation are reviewed. As a result of the bad years, beginning in 1967, the majority of watering points used by both man and animal for drinking water have failed. These natural springs and hard-dug shallow wells depend heavily on annual recharge by rain water since they often do not penetrate deeply into the aquifer. As a result of the prolonged droughts and overgrazing, grazing areas have deteriorated, and the few seeds produced often fail to germinate for lack of moisture. Although accurate statistics were difficult to obtain, fairly extensive reductions in animal populations were estimated. Calf crops are likely to be greatly reduced in 1974 and 1975. Appraisals will be made of the expected needs of the livestock populations, and ways and means of rendering assistance to the affected areas in the Sahelian zone to avoid such disaster in the future will be investigated. (Mastic-Arizona)
W75-09785

HUNGRY DRYLANDS OF WESTERN RAJASTHAN NEED A NEW TECHNOLOGY,
Central Arid Zone Research Inst. Jodhpur (India). Dry Farming Research Main Centre.
R. P. Singh, H. S. Daulay, M. V. R. Prasad, and H. P. Singh.
Indian Farming, Vol 23, No 12, p 5-6, March, 1974.

Descriptors: *Arid lands, *Crop production, *Precipitation(Atmospheric), *Water conservation, *Soil amendments, Salinity, Fertilizers, Water harvesting, Evaporation, Mulching, Crops, Soil moisture, Moisture stress, Technology.
Identifiers: *India(Rajasthan).

An acute ecological imbalance of the components of productivity is responsible for limiting crop production in the drylands of western Rajasthan. In addition to low and erratic annual precipitation, problems include a high solar incidence, high wind velocity resulting in a high potential evapotranspiration, and sandy soils that are low in organic matter with poor moisture-holding capacities and high infiltration rates. Soils are often high in salinity and alkalinity; soil crust formation after sowing complicates the situation. A need exists for appropriate crop planning coupled with a flexible technology of moisture conservation and fertilizer use. Some practices that would improve crop production are: water harvesting to make full use of the limited precipitation, mulches to minimize evaporation losses, better choices of crops and varieties with characteristics such as drought tolerance and a suitable maturity pattern, fertilizers to increase yields and crop efficiencies, and the use of soil amendments for more efficient utilization of the limited soil moisture. (Mastic-Arizona)
W75-09789

THE ECOLOGICAL MANAGEMENT OF ARID AND SEMI-ARID RANGELANDS IN AFRICA AND THE NEAR EAST: AN INTERNATIONAL PROGRAMME.
For primary bibliographic entry see Field 6G.
W75-09791

FORAGE PREFERENCES OF TRAINED MULE DEER ON THE BEAVER CREEK WATERSHEDS,
Arizona Game and Fish Dept., Phoenix. Research Div.
D. J. Neff.
Special Report No. 4, June, 1974. 61 p, 15 fig, 4 tab, 3 append.

Descriptors: *Habitat, *Habitat improvement, *Deer, *Watershed management, *Nutrient requirements, *Arizona, Wildlife Conservation, Wildlife habitats, Diets, Foods, Forages.
Identifiers: Mule deer, *Beaver Creek watersheds(Ariz).

Deer forage preferences were studied in relation to experimental vegetation treatments in the ponderosa pine and pinyon-juniper types on the Beaver Creek Watersheds. A total of 203 plant taxa were tested in the field in the Utah juniper, alligator juniper, and ponderosa pine vegetation types. Watersheds treatments in the sample areas included juniper cabling, pushing, felling, and aerial herbicide application; ponderosa pine clear-cutting, strip-cutting, and wildlife burn. Under present conditions, with moderate cattle grazing and a low density deer herd, the Beaver Creek watershed study area offers an abundance of high quality forage. The experimental watershed treatments which have produced the best forage crops have combined thinning or clearing of overstory with soil disturbance from skidding or slash-piling machinery. The best diversity of forage plant species on Beaver Creek was provided by an interspersion of treated and untreated vegetation. Large uniform blocks of any one type of vegetation are likely to provide less attractive deer range. Present trends in Forest Service management practices appear to be in accordance with the principle of greater vegetation interspersion and diversity. Thus, watershed treatment practices are not inherently in conflict with the forage needs of deer. (Bowden-Arizona)
W75-09793

DROUGHT IN THE GHANA SAVANNAH: A REPORT TO THE U.S. AID MISSION TO GHANA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6G.
W75-09795

FOR RAINFED AREAS-IMPROVED VELVET BEANS FOR INCREASED FORAGE PRODUCTION,
Indian Grassland and Fodder Research Inst., Jhansi.
M. L. Magoon, A. Singh, and K. L. Mehra.
Indian Farming, Vol 23, No 12, p 23-25, March 1974. 3 fig.

Descriptors: *Arid lands, *Plant bleeding, *Soil moisture, Soil erosion, *Beans, *Water utilization, Hay, Fertility, Soil texture, Nitrogen fixation, Organic matter, Agroclimatology, Forage mixtures, Forage legumes.
Identifiers: *Velvet beans, Fodder, *India.

Velvet beans are ideally suited for dryland areas. They not only have value as fodder and to a limited extent as a vegetable, they also have the unique quality of improving soils in sandy areas. The velvet beans are able to put up vigorous growth and cover the ground completely in a short period of time, smothering weeds and conserving soil moisture. In this manner they prevent soil erosion and improve soil fertility and texture by the addition of organic matter and by fixing the free atmospheric nitrogen. Two varieties, Florida and Lyon beans, provide excellent green fodder for cattle and sheep. The dry pods and seeds are also good sources of protein and can be fed as hay or silage. Genetic information is being collected and research is being carried out to meet the increasing demand for superior varieties of Velvet beans for the different agro-climatic conditions. About 35 species are known, both annual and perennial legumes, of which 15 are present in India. (Mastic-Arizona)
W75-09796

HIGH MILK PRODUCTION UNDER UNFAVOURABLE NATURAL CONDITIONS,
Hebrew Univ., Jerusalem (Israel).
R. Volcani.
World Animal Review, No 8, p 28-33, 1973. 5 fig, 3 tab, 13 ref.

Descriptors: *Arid climates, *Milk, *Environmental control, *Water shortage, Nutrients, Animal physiology.
Identifiers: *Milk production, *Israel.

The arid and semiarid climate of Israel has made increases in milk production very difficult. The fertile and semifertile zones are very limited in extent, and often these areas are faced with water shortages. Water is piped from the Jordan and other smaller rivers to the Negev in order to produce food for cattle and dairy cows. Israel's Friesian dairy herd consists of about 100,000 milking cows. Milk production is about 6,600 liters per year per cow. Average production per cow is 10-20 percent higher in large herds because a more intensive feeding and management program is practiced. Producers are being urged to increase milk and beef production as a result of increased demand by a larger population at a higher standard of living. This can be accomplished by increasing the number of milking cows, by increasing the production per cow, or by increasing both simultaneously. The Ministry of Agriculture is attempting to increase productivity per cow which seems to be most economical in the long run. This may be accomplished through intensive feeding and management of the entire herd including importation of purebred bulls, large scale industrial dairies, and elimination of climatic stress on the cows by temperature and humidity control. (Mastic-Arizona)
W75-09797

WATER REQUIREMENTS AND LIMITATIONS IMPOSED ON AGRICULTURAL DEVELOPMENT IN NORTHERN GHANA,
G. Benneh.
In: Factors of Agricultural Growth in West Africa, Proceedings of an International Conference held at Legon, April, 1971, University of Ghana, Legon, Institute of Statistical, Social and Economic Research, p 71-81, (1971). 6 fig, 1 tab, 22 ref.

Descriptors: *Africa, *Demonstration farms, *Soil-water-plant relationships, Groundwater

availability, *Drought, Agriculture, Grasslands, Climatic data, Education, Dry farming, Irrigation, Sorghum, Cotton, Rice, Food and cover crops, Water yield improvement.
Identifiers: *Ghana.

The northern savannah belt of Ghana, virtually empty, under-utilized and with months of rainless weather, is regarded as the future granary of the country. Two variables stand in the way of this agricultural hope for the region; the region's farmers have primitive techniques and between November and March almost no rain falls in the area. Also, the amount of rain during the March-November rainy season varies a great deal. Soil moisture calculations indicate that northern Ghana can be broken into three different regions with potential crops being rice, yams, maize in the wettest, cotton in the part with four humid months, and millet, sorghum and groundnuts in the dryest region. Irrigation may solve some agricultural difficulties. However, no useable groundwater has been found for even small irrigation schemes. Capture of surface runoff during the rainy season by dams could lead to some medium size irrigation projects. One block of several hundred thousand acres in the Upper Volta Valley has high potential for such a project. However, a massive education of the region's farmers will be necessary to make irrigated agriculture on such a scale successful. (Bowden-Arizona)
W75-09800

INDIA CASE STUDY ON IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS.
Food and Agricultural Organization of the United Nations, Rome (Italy). Committee on Agriculture.
COAG/74/4, Appendix I, April, 1974. 16 p, 2 tab.

Descriptors: *Soil moisture, *Asia, *Irrigation, *Soil-water-plant relationships, *Demonstration farms, *Dry farming, Agriculture, Fertilizer, Plant breeding, Area redevelopment, Arid lands, United Nations, Crop production.
Identifiers: *India.

The low rainfall areas of India comprise 79 administrative districts, representing 34.1% of the net area of land planted. While the soils in these areas are low in organic matter, water is the major limiting factor in crop yields. Small holdings and primitive farming methods also lower yields. Surface water is negligible, and groundwater limited; large scale irrigation schemes have slight application in the future. Infiltration of water into the soil can be increased by contouring, mulching and increasing organic content of soil. Impoundment of water runoff by dams, etc, requires that farming techniques be changed to reap the full benefit of the additional soil moisture. It is essential to educate farmers to the needs and virtues of new crop varieties. Without the ready local availability of seed of suitable varieties, fertilizer, agricultural equipment, the means of acquiring them more probably on credit than for cash, and finally a marketing organization for produce, the typical farmer of such regions is unlikely to derive much benefit from new techniques, and thus unlikely to use them. (Bowden-Arizona)
W75-09803

INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09812

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ECONOMICS AND FINANCE OF NEVADA PUBLIC WATER SYSTEMS,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 6B.
W75-09375

THE OPTIMUM DISTRIBUTION OF URBAN WATER SUPPLIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
C. Hadjitheodorou, and W. Heenan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 382, $3.75 in paper copy, $2.25 in microfiche. Puerto Rico Water Resources Research Institute, Mayaguez, Completion Report, April 1975. 42 p, 3 fig, 2 tab, 13 ref. OWRT A-039-PR(1).

Descriptors: *Water supply, Water demand, Cost analysis, *Optimization, *Water distribution(Applied), *Puerto Rico, Water treatment, Treatment facilities, *Linear programming, Optimum development plans, Cities, Urbanization.
Identifiers: Mayaguez(P.R.).

Increasing costs of supplying water to urban centers necessitate the rational analysis of such water distrbution systems, in an effort to hold the water supply costs to a minimum. Optimization of urban water distribution systems may be investigated by appling linear programming techniques to minimize the costs between water supply and demand areas. The water distribution system of the city of Mayaguez, P. R. was studied. The city is supplied by two water treatment plants of combined capacity 16 million gallons per day. Treated water is supplied by gravity to twenty-two demand areas within the city, through a distribution system consisting of approximately 100 miles of main, ranging from 2 inches to 20 inches in diameter. The costs of distributing water from the supply to the demand areas include pumping raw water to plants, water treatment, water loss, and system maintenance. The distribution system was first analyzed as a classic transportation problem in which demand areas should be supplied in such a way as to minimize the total distribution cost, under the constraints that the total amount supplied by each supply area must not exceed its capacity, and that the amount demanded by an area must be fully satisfied. In addition to the transportation analysis, a network model was developed for the Mayaguez distribution system. The network analysis maintains the same objective function, i.e. it minimizes the total distribution cost, however, different constraints are obtained by applying a material balance of water in, out, and consumed at each network node.
W75-09377

WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.
San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6D.
W75-09400

AN INVESTIGATION INTO THE POTENTIAL USES OF TRICKLE IRRIGATION FOR DESERT RECLAMATION AND FODDER PRODUCTION IN THE EMIRATE OF ABU DHABI,
Agricultural Planning Associates Ltd., London (England).
A. F. Willens, and G. A. Willens.
In: Proceedings of the Second International Drip Irrigation Congress, p 388-393, (1974). 4 tab, 4 ref.

Descriptors: Crop response, *Land reclamation, *Deserts, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation, *Abu Dhabi.

An initial investigation into the possible uses of trickle irrigation to establish a range of plant species which could be potentially useful as fodder is described. The use of trickle irrigation for fodder tree production shows considerable potential and appears economically viable within the present social context of Abu Dhabi. (See also W75-09423) (Skogerboe-Colorado State)
W75-09487

DYNAMIC PROGRAMMING OPTIMIZATION: A WATER DISTRIBUTION SYSTEM DESIGN,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W75-09525

STATE OF ARIZONA, ENVIRONMENTAL SERVICES NEEDS STUDY FOR GREENLEE COUNTY, 1970-1990.
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 5D.
W75-09584

EVAPORATION FROM WATER SURFACES IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2D.
W75-09586

OPTIMIZING LONG-TERM STREAMFLOW FORECASTS,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
J. F. Zuzel, D. C. Robertson, and W. J. Rawls.
Journal of Soil and Water Conservation, Vol 30, No 2, p 76-78, March-April 1975. 1 fig, 4 tab, 5 ref.

Descriptors: *Streamflow, *Forecasting, *Streamflow forecasting, Water balance, *Idaho, Snowmelt, Snowpacks, Hydrology, Runoff forecasting, Runoff, *Optimization, Regression analysis, Model studies, Hydrologic budget, Watershed(Basins).

An optimization technique was used to determine coefficients in a linear forecast model. Runoff volume was the dependent variable for a forecast period. The snow-water contents of n snow courses at a specific time were the independent variables. The procedure minimizes runoff volume errors for specific forecast periods and preserves the hydrologic significance of the forecast equation because all parameters are explainable from a water balance standpoint. The results indicated that the technique effectively reduces long-term streamflow volume forecast errors. Average error was 5% less than the published forecasts for two southwest Idaho drainage basins of 2150 and 7000 square kilometers. (Lee-ISWS)
W75-09594

IMPROVING THE DESIGN OF PRACTICAL FIELD DRAINAGE,
Ministry of Agriculture, Fisheries and Food, Cambridge (England). Field Drainage Experiment Unit.
B. D. Trafford.
Soil Science, Vol 119, No 5, p 334-338, May 1975. 4 fig, 14 ref.

Descriptors: *Drainage, *Design, *Optimization, Drainage systems, Depth, Water table, Hydraulic

conductivity, Soil types, Mole drainage, Cost-benefit ratio, Evapotranspiration, Model studies.
Identifiers: *England, Parallel drains, Line sinks, Spacing, Waterlogging.

Mathematical models exist to determine the optimum depth and spacing of field drains from measurements of hydraulic conductivity, or indirect estimates of this. The results are reasonably useful as long as the hydraulic conductivity exceeds perhaps 0.1-0.2 m/day. For heavier, less permeable soils, it is necessary either to use very cheap 'pipes' (mole drains) at the calculated spacing or normal pipes at wider spacing after increasing the hydraulic conductivity by subsoiling. (Visocky-ISWS)
W75-09595

CORRUGATED PLASTIC DRAIN TUBING USED AS UNDERGROUND CONDUIT,
Missouri Univ., Columbia. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W75-09611

ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-09615

ATLAS OF RIVER BASINS OF THE UNITED STATES.
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 7C.
W75-09616

INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

MATHEMATICAL MODELS IN HYDROLOGY,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W75-09624

DRAINAGE MATERIALS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
For primary bibliographic entry see Field 8G.
W75-09628

SURVEY OF EXPERIENCE WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Rijksstation voor Landbouwtechniek, Merelbeke (Beligium).
For primary bibliographic entry see Field 8G.
W75-09629

STUDY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF SPECIFICATIONS AVAILABLE IN FRANCE,
Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forets et l'Equipment Rural, Antony (France).
For primary bibliographic entry see Field 8G.
W75-09630

EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Kuratorium fuer Kulturbauwesen, Hanover (West Germany).
For primary bibliographic entry see Field 8G.
W75-09631

A SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Vizgazdalkodasi Tudomanyos Kutato Intezet, Budapest (Hungary).
For primary bibliographic entry see Field 8G.
W75-09632

DRAINAGE MATERIALS - PROVISIONAL REPORT OF THE EXPERIENCE GAINED IN THE NETHERLANDS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 8G.
W75-09633

SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Ministry of Agriculture, Fisheries and Food, Cambridge (England).
For primary bibliographic entry see Field 8G.
W75-09634

INDEX 1945-1966, LAND AND WATER.
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
For primary bibliographic entry see Field 10C.
W75-09635

MAP SHOWING DRAINAGE AREAS, MARLBOROUGH QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-09704

MAP SHOWING DRAINAGE AREAS, WEST SPRINGFIELD QUADRANGLE, MASSACHUSETTS-CONNECTICUT,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09705

MAP SHOWING DRAINAGE AREAS, LUDLOW QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09707

MAP SHOWING DRAINAGE AREAS, MOUNT TOM QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 7C.
W75-09708

TEMPERATURES OF STREAMS AND SELECTED RESERVOIRS IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-09713

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2A.
W75-09718

OCCURRENCE OF PESTICIDE RESIDUES IN FOUR STREAMS DRAINING LAND-USE AREAS IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W75-09720

STREAM ORDERING AND CONTOUR MAPPING,
University of Western Ontario, London. Dept. of Geography.
W. Warntz.
Journal of Hydrology, Vol 25, No 3/4, p 209-227, May 1975. 9 fig, 6 tab, 11 ref.

Descriptors: *Geomorphology, *Drainage density, *Topographic mapping, Streams, Land forming, Topography, Shape, Running waters, Gradients(Streams), Terrain analysis, Quaternary period, Contours.
Identifiers: *Stream order, Physical geography, Contour mapping.

The necessary, sufficient, possible, and likely geometrical and topological characteristics of stream drainage basins of various orders were described. A suggestion was made for experimental topographic mapping to bring it closer to the current theory of spatial hierarchical systems. Stream ordering was examined and a recommendation was offered that streams now considered as of first order be regarded as of zero order. This simplifies mathematical notation for the Horton-Strahler-Woldenberg type of analysis in quantitative geomorphology and has added intellectual interest by facilitating the understanding of the virtually infinite cyclical regress in the patterns of surface features down to individual particle size. (Jess-ISWS)
W75-09745

MAN-INDUCED CHANGES OF MIDDLE MISSISSIPPI RIVER,
Colorado State Univ., Fort Collins.
M. A. Stevens, D. B. Simons, and S. A. Schumm.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Paper 11281, p 119-133, May 1975. 9 fig, 6 tab, 8 ref, 1 append. Army Contract DACW 39-73-C-0026.

Descriptors: *Channel improvement, *Levees, *Dikes, *Inland waterways, *River regulation, Floods, Stream erosion, Stream stabilization, Sediment discharge, Navigable rivers, Control, Mississippi River, Missouri River.
Identifiers: *Middle Mississippi River, Kaskaskia River.

The objectives of the 150 years of development along the Middle Mississippi River have been to provide flood protection to people and property on the floodplain by building levees and to provide a suitable channel for navigation by contracting the river channel from St. Louis to Cairo, Illinois. The developments for flood protection and navigation have produced a new river morphology and a different river behavior. The channel position has been relatively stable for at least the last century, although the position and size of islands within the channel have changed from time to time. In the period between 1888 and 1968, the river surface was reduced by approximately one-third, the island area by one-half, and the river bed area by one-fourth. The river channel was deepened for navigation by decreasing channel width with rock and pile dikes. River bed degradation has occurred where the river channel was narrowed. A major influence on flows has been the construction of storage dams on the Missouri River since 1940. The effect of upstream developments has been the reduction in frequency of large flood flows, and the increase in minimum flow. (Singh-ISWS)
W75-09754

MAKEUP REQUIREMENTS FOR COOLING PONDS,
Hanford Engineering Development Lab., Richland, Wash.
For primary bibliographic entry see Field 5G.
W75-09760

RESERVOIR OPTIMIZATION FOR WATER QUALITY CONTROL,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5G.
W75-09773

INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09812

DETAILED PROJECT REPORT FOR LOCAL FLOOD PROTECTION, ZACATE CREEK, LAREDO, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as EIS-TX-73-1926-F, $5.75 in paper copy, $2.25 in microfiche. December 12, 1973. 139 p, 13 map, 6 fig, 4 graph.

Descriptors: *Channels, *Flood protection, *Recreation facilities, Vegetation, Stagnant water, Landscaping, Mosquitoes, Wildlife, Streams, Parks, *Texas, Diseases, Environmental effects, Floodproofing, Flood plains, Flood forecasting, Flood control, Reservoirs.
Identifiers: *Environmental Impact Statements, Laredo(Tex), Zacate Creek(Tex).

The proposed action involves construction of an improved channel and open space park along Zacate Creek to provide adequate flood protection and recreational facilities for residents of Laredo, Texas. The project will remove refuse and garbage which presently litters the creek. The removed vegetation, caused by the channel construction, will be replaced with grass and landscaping. It is anticipated that stagnant pools, mosquitoes, rats and disease will be eliminated. Wildlife will be displaced from the creek, but probably will relocate in the park and open space area. The primary adverse environmental effect will be elimination of approximately 2.5 miles of a seminatural, intermittent stream and axxociated natural cover and wildife. Alternatives considered are: Flood proofing, evacuation of the flood plain, land use regulations, flood forecasting and warning with temporary evacuation, flood control reservoir, eight channelization plans, and recreation facilities provided by other agencies. (Gagliardi-Florida)
W75-09813

EDIZ HOOK BEACH EROSION CONTROL, PORT ANGELES, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 8A.
W75-09815

TABLE ROCK LAKE, WHITE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Little Rock, Ark.
For primary bibliographic entry see Field 8C.
W75-09818

BUSHLEY BAYOU, LOUISANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W75-09819

PREVENTION AND MITIGATION OF SHORE DAMAGES, KAHULUI HARBOR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 8A.
W75-09825

FLORIDA WATER RESOURCES ACT OF 1972 (STATUTE ESTABLISHING WATER MANAGEMENT DISTRICTS FOR THE STATE OF FLORIDA).
For primary bibliographic entry see Field 6E.
W75-09833

ARTIFICIAL ISLANDS AND INSTALLATIONS IN INTERNATIONAL LAW,
Rhode Island Univ., Kingston. Law of the Sea Inst.
For primary bibliographic entry see Field 6E.
W75-09834

4B. Groundwater Management

AN OPTIMAL WATER QUALITY MANAGEMENT TECHNIQUE FOR CONJUNCTIVE GROUND AND SURFACE WATER USE,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Sciences.
For primary bibliographic entry see Field 5G.
W75-09378

RECHARGE SIMULATION MODEL,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-09518

A COVERED DOMESTIC LAGOON SYSTEM FOR NATURAL GROUND WATER RECHARGE NEAR METROPOLITAN AREAS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-09524

GOUNDWATER MODELS,
For primary bibliographic entry see Field 2F.
W75-09582

GROUND-WATER LEVEL IN THE FLOOD PLAIN AND ADJACENT UPLANDS OF THE SANGAMON RIVER,
Illinois Univ., Urbana. Dept. of Forestry.
D. T. Bell, and F. L. Johnson.
Transactions of the Illinois State Academy of Science, Vol 67, No 4, p 376-383, December 1974. 3 fig, 1 tab, 7 ref. Army DACW 23-73-C-0020.

Descriptors: *Groundwater, *Flood plains, *Surface-groundwater relationships, *Illinois, Water table, Rivers, Streams, Precipitation(Atmospheric), Evapotranspiration, Forests, Ecosystems, Environmental effects, On-site investigations, Evaluation, Data collections.
Identifiers: *Sangamon River(Ill).

The influence of river level, precipitation, and evapotranspiration on the water table fluctuations of the streamside forest ecosystem was determined from observation well data at four locations in the upper Sangamon River bottoms and adjacent uplands. Water levels in the soil profile of the floodplain areas of the streamside forest were strongly controlled by the level of the water in the stream channel. Changes in the upland water table, however, were not closely correlated to river level changes. Precipitation was the environmental variable most strongly influencing changes in the upland groundwater system. Evapotranspiration losses in midtransect areas may exceed infiltration of groundwater from the river and drainage from higher levels during certain summer periods. The strong correlation of the river level to groundwater level indicated that the fluctuation in the level of the water table in the floodplain areas of the Sangamon River was much the same in 1974 as they were in primitive times. An hypothesis concerning the possible changes which may occur with construction of the William L. Springer Project was discussed. A thorough understanding of existing physical environmental conditions in the streamside ecosystem is essential to understanding the streamside forest ecosystem. More complete information on species tolerances is required for assessment of the effects of the changing soil saturation conditions on the streamside forest ecosystem. (Humphreys - ISWS)
W75-09599

FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-09703

GROUNDWATER LEVELS IN NEBRASKA, 1974,
Geological Survey, Lincoln, Nebr.
M. J. Ellis.
Nebraska Water Survey Paper No 40, May 1975. 86 p, 12 fig, 1 tab, 21 ref. Published by University of Nebraska Conservation and Survey Division, Lincoln.

Descriptors: *Groundwater resources, *Water wells, *Water level fluctuations, *Nebraska, Water utilization, Industries, Irrigation, Water supply, Observation wells, Hydrologic data, Data collections.

Water levels for the year 1974 and changes from predevelopment levels and previous fall levels are tabulated for approximately 700 wells in Nebraska. Several hydrographs also are included. Use of groundwater for irrigation and industrial purposes has stabilized the economy of large areas in Nebraska. Groundwater is being withdrawn in areas of the state at rates greater than rates of replenishment and significant declines in water levels have occurred. On the other hand, water levels have risen signficantly in some areas of the state where surface water is used for irrigation. (Woodard-USGS)
W75-09710

GREAT LAKES BASIN FRAMEWORK STUDY: APPENDIX 3--GEOLOGY AND GROUND WATER,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2F.
W75-09714

SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1973,
Geological Survey, Tallahassee, Fla.
H. J. McCoy.
Open-file report FL 47030, 1974. 99 p, 13 fig, 12 ref, append.

Descriptors: *Hydrogeology, *Florida, *Groundwater, *Water balance, Withdrawal, Water yield, Water quality, Basic data collections, Hydrologic data.
Identifiers: *Naples(Fla), Collier County(Fla).

The reaction of the coastal aquifer in Naples, Florida, to the stress of increased water demand was studied during a period of deficient rainfall. When the aquifer is under severe stress--such as in the 1972-73 dry season--the quantity of water percolating downward from the upper shallow zone, through the less permeable confining zone and into the pumping zone is much less than the quantity being withdrawn and large differentials in head (as much as 10 feet) between the shallow and pumping zones occur. Rainfall during 1973 was about 80 percent of the 32-year average in the Naples area,

90 percent of average at Everglades City, and slightly above average at Immokalee. Water levels at the beginning of the 1973 water year (October 1, 1972) were generally a foot lower than at the same time in 1971. The levels recovered to about 1972 water levels in July and August of 1973. Flow characteristics in the five major canals were similar to the groundwater fluctuations. Water quality remained about the same as for 1972 except for fecal and total coliform concentrations at one site in Naples. The fecal coliform concentration set a record high and total coliform concentration was next to the highest on record. (Knapp-USGS)
W75-09716

AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,
Geological Survey, Providence, R.I.
For primary bibliographic entry see Field 2F.
W75-09721

HYDROLOGIC ANALYSIS OF THE VALLEY-FILL AQUIFER, NORTH PLATTE RIVER VALLEY, GOSHEN COUNTY, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2F.
W75-09722

GEOCHEMISTRY APPLIED TO THE DISCOVERY, EVALUATION, AND EXPLOITATION OF GEOTHERMAL ENERGY RESOURCES,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W75-09724

DATA FROM A 1,000-FOOT (305-METRE) CORE HOLE IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-09728

NUMERICAL ANALYSIS OF CONFINED-UNCONFINED AQUIFERS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W75-09751

A CASE STUDY OF MINE WATER QUALITY DETERIORATION, MAINSFORTH COLLIERY, COUNTY DURHAM,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 5B.
W75-09752

HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-09769

SEWAGE DISPOSAL AND WATER SUPPLY ALTERNATIVES ON THE BASIS OF WATER QUALITY AND ECONOMIC CRITERIA,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W75-09774

GYPSUM CAN IMPROVE YOUR WATER ALSO,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 5G.
W75-09787

FLORIDA WATER RESOURCES ACT OF 1972 (STATUTE ESTABLISHING WATER MANAGEMENT DISTRICTS FOR THE STATE OF FLORIDA).
For primary bibliographic entry see Field 6E.
W75-09833

4C. Effects On Water Of Man's Non-Water Activities

FOREST FIRE: EFFECT ON PHOSPHORUS MOVEMENT TO LAKES,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W75-09364

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: REVIEW AND BIBLIOGRAPHY,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W75-09576

ARIZONA'S REMOTE SUBDIVISIONS: AN INVENTORY,
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 6G.
W75-09583

WATER FOR ENERGY SELF-SUFFICIENCY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.
Water Resources Council, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.70. October, 1974, 18 p.

Descriptors: *Comprehensive planning, *Institutional constraints, *Energy, *Hydroelectric power, *Water distributio(Applied), Water supply, *Water supply development, *Water quality, Colorado River Basin, Mississippi River, Power system operation, Water delivery, Water cooling, North America, Power plants, Planning, Arid lands, Semiarid climates, Decisionmaking, Financing.

Recommendations include: A detailed national analysis of water availability should be accomplished as soon as projected water requirements for energy-related purposes are fully known, together with that for all competing purposes. Water for energy must be provided to the extent possible through the existing institutional framework. The adequacy of the existing regional and national institutions for management of water and land resources and for resolution of conflicts arising from competing resource uses should be analyzed and needed strengthening accomplished. Environmental hazards and constraints, land use adjustments, and social and economic impacts likely to result from providing necessary water for energy self-sufficiency should be identified and described and the information made available to the public. The states' programs of comprehensive water and related land resources analysis and planning should be given Federal encouragement and assistance to assure capability for adequate and timely decisionmaking at the State and local level and to focus needed attention on energy related water matters. Priority should be given in Federal funding to certain projects, programs, and investgations because of their significant contribution to either early provision of energy, water for energy purposes, or to overcoming present limitations on water availability for energy purposes. (See also W75-09626)
W75-09627

EFFECTS OF DEFORESTATION ON SLOPES,
Washington Univ., Seattle. Dept. of Civil Engineering.
C. B. Brown, and M. S. Sheu.
Journal of the Geotechnical Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No GT2, Paper 11141, p 147-165, February 1975. 7 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Slope stability, *Forests, *Lumbering, *Soil engineering, Stability, Analytical techniques, Mathematical studies, Theoretical analysis, Vegetation effects, Root systems, Creep, Soil moisture, Water table, Vegetation, Soil physical properties, Soil mechanics.

The creep and stability of slopes before and after logging were analyzed. The following effects of vegetation were included in the theory: (1) the root system provides mechanical reinforcement of the soil; (2) vegetation provides a vertical surchange; (3) wind in trees causes surface shears and moments; and (4) soil moisture content and water level are modified. It was found that immediately after log removal the reduction in the overburden decreases the creep rate. Also, this reduction and the drop in wind loading increases the slope stability. The immediate effect of deforestation is, therefore, favorable, but adverse effects become evident when the root system decays and when a drop in evapotranspiration causes a rise in the water table. (Humphreys-ISWS)
W75-09743

URBAN RUNOFF POLLUTION CONTROL--STATE-OF-THE-ART,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-09762

THE SAHELIAN DROUGHT - A DISASTER FOR LIVESTOCK POPULATIONS,
Food and Agricultural Organization of the United Nations, Rome (Italy). Animal Production and Health Div.
For primary bibliographic entry see Field 3F.
W75-09785

EVALUATING EFFECTS OF WATER RESOURCE DEVELOPMENTS ON WILDLIFE HABITAT,
Missouri Dept. of Conservation, Jefferson City.
For primary bibliographic entry see Field 6G.
W75-09790

THE ECOLOGICAL MANAGEMENT OF ARID AND SEMI-ARID RANGELANDS IN AFRICA AND THE NEAR EAST: AN INTERNATIONAL PROGRAMME.
For primary bibliographic entry see Field 6G.
W75-09791

A SURVEY OF THE NESTING HABITATS OF THE WHITE-WINGED DOVE IN ARIZONA,
Arizona Game and Fish Dept., Phoenix. Research Div.
For primary bibliographic entry see Field 6G.
W75-09794

DROUGHT IN THE GHANA SAVANNAH: A REPORT TO THE U.S. AID MISSION TO GHANA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 6G.

W75-09795

DROUGHT, A RECURRENT ELEMENT OF CLIMATE,
Maryland Univ., College Park. Graduate Program in Meteorology.
For primary bibliographic entry see Field 2B.
W75-09799

DETERIORATION OF THE ECOLOGICAL EQUILIBRIUM IN THE ARID ZONES OF NORTH AFRICA,
For primary bibliographic entry see Field 6G.
W75-09802

4D. Watershed Protection

DRIP IRRIGATION IN LANDSCAPING AND SOIL EROSION CONTROL,
Kuluwai Irrigation Corp., Haleiwa, Hawaii.
M. D. Farrell.
In: Proceedings of the Second International Drip Irrigation Congress, p 44-45, (1974).

Descriptors: *Soil erosion, *Landscaping, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation.

Briefly discussed are design, filtration, problems, and controls with drip irrigation in landscaping situations. (See also W75-09423) (Skogerboe-Colorado State)
W75-09429

REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2A.
W75-09621

SEDIMENT YIELDS FROM INTERMEDIATE-SIZED STREAM BASINS IN SOUTHERN ALBERTA,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W75-09750

FORAGE PREFERENCES OF TRAINED MULE DEER ON THE BEAVER CREEK WATERSHEDS,
Arizona Game and Fish Dept., Phoenix. Research Div.
For primary bibliographic entry see Field 3F.
W75-09793

WATER REQUIREMENTS AND LIMITATIONS IMPOSED ON AGRICULTURAL DEVELOPMENT IN NORTHERN GHANA,
For primary bibliographic entry see Field 3F.
W75-09800

NORTH FORK NOLIN RIVER WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09814

UPPER MULBERRY RIVER WATERSHED, BARROW, GWINNETT, HALL, AND JACKSON COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09822

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DETERMINATION OF CHLORIDE IN WATER WITH A HGS/HG2CL2 ELECTRODE,
Canada Centre for Inland Waters, Burlington (Ontario).
I. Sekerka, J. F. Lechner, and R. Wales.
Water Research, Vol 9, No 7, p 663-665, July, 1975. 1 fig, 4 tab, 13 ref.

Descriptors: *Water analysis, *Chlorides, *Trace elements, Water pollution sources, Natural streams, Industrial water, Waste water(Pollution), *Electrodes, *Pollutant identification, Water pollution, Water chemistry, Ions, Analytical techniques, Pollutants, Electrodes.

The application of a new type of solid state chloride ion sensitive electrode, based on HgS/Hg2Cl2, has been investigated for manual and automated measurements of chloride in natural, industrial and waste waters. TThe electrode display Nerstian response for the range 0.05-3.500 ppm of chloride and can be used for concentrations down to 0.05 ppm. Achieved values of standard deviation, recovery, and comparative tests from a variety of water samples are highly satisfactory. Inherent simplicity and sensitivity together with obtained results demonstrate the usefulness of the proposed method in routine analysis. (Witt-IPC)
W75-09361

MULTIELEMENT NEUTRON ACTIVATION ANALYSIS OF FRESH WATER USING GE(LI) GAMMA SPECTROMETRY,
Institutt for Atomenergi, Kjeller (Norway).
B. Salbu, E. Steinnes, and A. C. Pappas.
Analytical Chemistry, Vol 47, No 7, p 1011-1016, June, 1975. 2 fig, 4 tab, 16 ref.

Descriptors: Freshwater, *Water analysis, *Trace elements, *Pollutant identification, *Neutron activation analysis, Analytical techniques, Instrumentation, Water pollution sources, Water chemistry, Water quality, Water properties, Water pollution, Computers, Data processing, Pollutants.

A simple and rapid method for the determination of trace elements in natural fresh water by purely instrumental neutron activation analysis is presented. The method which is based on Ge(Li) gamma spectrometry and computer evaluation of recorded data allows up to 40 elements to be determined without any preconcentration steps. Data illustrating the precision of the method are given. The determination limit is approximately 1 microgram/liter or less for 30 of the elements, provided normal fresh water concentrations of elements giving rise to the most prominent activities (e.g., Al, Cl, and Na) are taken into account. Spectral interferences and other possible sources of systematic errors are discussed and shown to be of moderate importance in most cases. (Witt-IPC)
W75-09362

SIMULTANEOUS DETERMINATION OF SEVEN TRACE METALS IN POTABLE WATER USING A VIDICON ATOMIC ABSORPTION SPECTROMETER,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
K. M. Aldous, D. G. Mitchell, and K. W. Jackson.
Analytical Chemistry, Vol 47, No 7, p 1034-1037, June, 1975. 2 fig, 4 tab, 12 ref.

Descriptors: *Potable water, *Water analysis, *Pollutant identification, *Trace elements, *Spectrometers, Zinc, Cadmium, Nickel, Cobalt, Iron, Manganese, Copper, Metals, Chemical analysis, Analytical techniques, Water pollution sources, Water pollution, Waste water(Pollution), Instrumentation, Water chemistry, Water quality, Water properties, Pollutants.
Identifiers: *Atomic absorption spectrometer.

A multichannel atomic absorption spectrometer is used for the determination of Zn, Cd, Ni, Co, Fe, Mn, and Cu in potable waters. Metals are chelated with ammonium pyrrolidine dithiocarbamate at pH 4, and a 10-fold concentration is achieved by extracting into methyl isobutyl ketone. The organic phase is aspirated into an air-acetylene flame, and atomic absorption is measured simultaneously at the resonance lines of these elements by dispersing a 168 nm region of the lamp and flame spectrum across a vidicon array detector. Detection limits from 0.004 to 0.02 microgram/ml have been obtained, with dynamic ranges up to 100 and relative standard deviations of 3% at optimum concentrations. This performance, though poorer than by conventional single-channel atomic absorption spectrometry, is adequate for routine monitoring of public water supplies and most waste waters. (Witt-IPC)
W75-09363

GAS CHROMATOGRAPHIC DETERMINATION OF SELECTED ORGANIC COMPOUNDS ADDED TO WASTE WATER,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
B. M. Austern, R. A. Dobbs, and J. M. Cohen.
Environmental Science and Technology, Vol 9, No 6, p 588-590, June, 1975. 5 tab, 5 ref.

Descriptors: *Water analysis, *Organic compounds, *Gas chromatography, *Pollutant identification, Analytical techniques, Pollutants, Water pollution sources, Water pollution, Separation techniques, Water chemistry, Aromatic compounds, Chromatography.
Identifiers: Styrene, p-Xylene, Ethylbezene, Nitrogenzene, Acetophenone, o-Anisidine, Anethole, Trichloroethylene, Turpentine, Nonylphenol, Dimethyl phthalate, Freon.

Analytical procedures are described for the quantitative determination of styrene, p-zylene, ethylbenzene, nitrobenzene, Acetophenone, o-anisidine, anethole, trichloroethylene, turpentine, nonylphenol, and dimethyl phthalate, in spiked waste water. Extraction with Freon, concentration of the extract in a Kuderna-Danish apparatus, and gas chromatography are involved. Except for the gas chromatography, the analysis of 10 of the 11 compounds was identical. Trichloroethylene, because of its high volatility, was determined slightly differently. The methods are precise and sensitive to the low parts-per-billion range. (Witt-IPC)
W75-09365

DETERMINATION OF LEAD IN POTABLE WATERS USING DELVES CUP ATOMIC ABSORPTION SPECTROMETER WITH SIGNAL INTEGRATION,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
I. S. Maines, K. M. Aldous, and D. G. Mitchell.
Environmental Science and Technology, Vol 9, No 6, p 549-551, June, 1975. 2 fig, 2 tab, 6 ref.

Descriptors: *Potable water, *Lead, *Spectroscopy, *Water analysis, Analytical techniques, *Pollutant identification, Water pollution sources, Trace elements, Water chemistry, Instrumentation, Heavy metals, Pollutants, Water pollution.
Identifiers: Delves cup prodedure, *Atomic absorption spectrometer.

A rapid method for the determination of lead in potable water is described. A 50-200 microliter

sample is dispensed with 50 microliter of gelatin solution into a stainless steel cup, dried, and inserted into an air-acetylene flame. An automated atomic absorption spectrometer measures integrated absorbance. The procedure has a detection limit of 5 microgram of lead/liter, with calibration curves linear to 200 microgram of lead/liter. Typical relative standard deviations are 2.5 and 10.2% for 100 and 20 microgram of lead/liter, respectively. When direct calibration was used, most potable water samples showed low recoveries, but use of standard additions avoided this problem. Fifty potable water samples were analyzed using the Delves cup procedure and solvent-extraction atomic absorption spectrometry. Statistical analysis (Student 't' test) showed excellent correlation between the two procedures. (Witt-IPC)
W75-09366

BOD AS A POLLUTION INDICATOR (LA DBO COMO INDICADOR DE LA POLUCION),
G. Van Beneden, and P. Van Beneden.
Investigacion y Tecnica del Papel, Vol 12, No 43, p 25-45, January 1975. 21 ref.

Descriptors: *Biochemical oxygen demand, *Water pollution, *Indicators, Municipal wastes, Industrial wastes, Water pollution sources, Self-purification, Photosynthesis, Mud, Rivers, Analytical techniques, Water pollution effects, Water quality, Bottom sediments, Water pollution, *Pollutant identification.

Techniques used for the evaluation of BOD in urban and industrial waste waters are reviewed. The phenomenon of self-purification of rivers is discussed, together with the roles of mud on the river bottom and of photosynthesis in the self-purification process. Methods of determining the self-purifying power of a river are also considered. (Sykes-IPC)
W75-09368

MEASURING FLOW OF POLLUTED EFFLUENTS (POUR LA MESURE DU DEBIT DES EFFLUENTS POLLUES).
Papier, Carton et Cellulose, Vol 24, No 3, p 31, March, 1975. 3 fig.

Descriptors: *Flowmeters, *Effluents, *Flow measurement, Venturi meters, Instrumentation, Effluents, Waste water(Pollution), Gages, Flow rates, Water measurement, *Pollutant identification, *Path of pollutants.
Identifiers: Contraflux flowmeter.

A whole series of instruments (threshold gages, venturi tubes, and the Contraflus--a specially modified venturi tube) offered by Societe Neyrpic B.M.B. particularly for measuring effluent flow under various conditions is briefly outlined. (Speckhard-IPC)
W75-09370

WATER ANALYSIS,
Geological Survey, Denver, Colo.
M. J. Fishman, and D. E. Erdmann.
Analytical Chemistry, Vol 47, No 5, p 334-361R, Annual review issue, April 1975. 663 ref.

Descriptors: *Water analysis, *Analytical techniques, *Bibliographies, *Pollutant identification, Alkali metals, Alkaline earth metals, Hardness(Water), Aluminum, Iron, Manganese, Chromium, Copper, Zinc, Lead, Cadmium, Cobalt, Mercury, Gold, Molybdenum, Boron, Arsenic compounds, Phosphorus, Silica, Halides, Sulfates, Sulfides, Nitrates, Nitrites, Ammonia, Organic matter, Hydrogen ion concentration, Alkalinity, Carbon dioxide, Conductivity, Turbidity, Oxygen, Detergents, Metals, Pesticides, Herbicides, Fungicides, Oxygen demand, Radioisotopes.
Identifiers: Tin, Silver, Vanadium, Bismuth, Uranium, Thorium, Selenium, Antimony, Rare earths, Organic nitrogen, Cyanide, Total carbon.

This review of the literature of analytical chemistry applied to water analysis covers the period from October, 1972 through September, 1974. It includes references to analytical methods for determining the following: alkali metals; hardness and alkaline earth metals; Al, Fe, Mn, Cr, Cu, Zn, Pb, Cd, Ni, Co, Sn, Hg, Ag, Au, Mo, V, Bi, U, Th, B, Se, As, Sb, P, silica, and rare earths; halides, sulfate, and sulfide; nitrate, nitrite, ammonia, organic N, and cyanide; pH, alkalinity, carbon dioxide, conductance, and turbidity; oxygen and other gases; detergents, pesticides, herbicides, and fungicides; oxygen demand and total carbon; organic materials; and radionuclides. (Witt-IPC)
W75-09372

FLUID SAMPLING DEVICE,
Houma Valve Service, Inc., La. (assignee)
For primary bibliographic entry see Field 7B.
W75-09422

BIOLOGICAL CONTROL OF SPHAEROTILUS NATANS AND RELATED SPECIES IN WASTE WATERS,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5D.
W75-09520

BIOLOGICAL ASSAY OF FRESH WATERS BY A NEW METHOD, DIELECTROPHORESIS,
Oklahoma State Univ., Stillwater. Dept. of Physics.
H. A. Pohl, and K. Pollock.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 512, $3.25 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1975). 15 p, 7 fig, 7 ref. OWRT A-056-OKLA(1). 14-31-0001-5036.

Descriptors: *Bioassay, Assay, Algae, Systematics, *Analytical techniques, *Pollutant identification, *Electrophoresis, Water treatment, Separation techniques.
Identifiers: Cellular organisms assay, Chlorella vulgaris, Nonuniform field effects, *Dielectrophoresis.

Rapid and selective methods for assaying cellular organisms in fresh water are being sought by applying the selective effects of nonuniform electric fields. A typical alga, Chlorella vulgaris is readily and quickly collected from fresh water medium by the action of nonuniform field effects (NUFE). This alga exhibits a unique spectrum of response, in which the field response of the organism varies strongly with the applied frequency (100 Hz to 4 mega Hz). Since the original NUFE methods were essentially either batch or very small volume procedures (e.g. 0.01 to 0.5 ml), major emphasis has been upon developing continuous treatment techniques more suitable to fresh water problems. This research has developed a successful method called 'stream-centered' continuous dielectrophoresis (SCD). Preliminary tests using living cells have given encouraging results. The method is under active study for it has possibilities of wide application in cell study.
W75-09531

CHEMICAL TRANSPORT BY THE MEKONG RIVER,
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
For primary bibliographic entry see Field 5B.
W75-09603

COMPARATIVE ECOLOGY OF WESTERN STREAMS,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5G.
W75-09617

DEVICE FOR UNDERWATER OBSERVATION,
For primary bibliographic entry see Field 7B.
W75-09640

DETECTOR OF TRACE SUBSTANCE IN WATER,
Shibata Kagaku Kikai Kogyo Kabushiki, Tokyo (Japan). (assignee)
T. Fujinaga, and K. Miura.
US Patent No 3,883,414, 8 p, 14 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 733, May 13, 1975.

Descriptors: *Patents, Water pollution sources, *Water pollution control, Water quality control, Water analysis, Monitoring, Industrial wastes, *Electrolysis, *Pollutant identification, Ions.

The invention provides a new device and method for automatically detecting and regulating and/or removing concentrations of various substances in aqueous solutions, such as for example, regulating the degree of pollution of urban rivers or industrial effluents, by electrolyzing the ions of these substances dissolved therein through a flow electrolyte cell; then depositing and condensing or dissolving, automatically and with high accuracy, continuously or discontinuously, according to the respective electrolytic potentials of these substances. (Sinha-OEIS)
W75-09655

EFFECTS OF SALINE WATER FROM NORTH DAKOTA LAKES ON SURVIVAL OF FATHEAD MINNOW (PIMEPHALES PROMELAS) EMBRYOS AND SAC FRY,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-09669

AN INEXPENSIVE MACROINVERTEBRATE BIOASSAY TABLE FOR USE IN CONTINUOUS-FLOW TOXICITY TESTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. F. Maciorowski.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 420-423, April 1975. 3 fig, 4 ref.

Descriptors: *Equipment, Technology, *Design, *Bioassay, Specifications, Laboratory tests, Invertebrates, Toxicity, Pollutant identification.
Identifiers: Continuous-flow bioassay table, *Toxicity tests.

A bioassay apparatus for macroinvertebrates was designed to meet the following criteria: (1) accommodate a large number of tests; (2) be generally acceptable to a wide range of macroinvertebrate organisms; (3) require a minimum of space; (4) be relatively inexpensive. One-gallon glass jugs were used as test chambers in the controlled temperature continuous-flow bioassay table. The apparatus is capable of accomodating fifteen concentrations of a single toxicant. The system is versatile and costs at least 50% less than a comparable system utilizing aquaria. (Katz)
W75-09676

AVOIDANCE OF FENITROTHION BY GOLDFISH (CARASSIUS AURATUS),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W75-09677

MERCURY IN SEALS, TERRESTIAL CARNIVORES AND PRINCIPAL FOOD ITEMS OF THE INUIT, FROM HOLMAN, N.W.T.,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
T. G. Smith, and F. A. J. Armstrong.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 795-801, Jun 1975. 1 fig, 2 tab, 24 ref.

Descriptors: *Mercury, *Public health, Mammals, *Animal physiology, *Water pollution effects, *Diets, Environmental effects, Food chains, Toxicity, Canada, Absorption, Pollutant identification.
Identifiers: Bioaccumulation, *Tissue analysis, *Selenium, *Metyl mercury, Liver, Muscle, Marine mammals, Terrestial carnivores, Inuit, Ringed seals, Phoca hispada botnica, Sledge dogs, Canis familiaris, Arctic wolves, Canis lupus, Arctic fox, Alopex lagopus, Bearded seals, Erignathus barbatus, Arctic char, Salvelinus alpinus, Caribou, Rangifer tarandus.

Total mercury analyses were made on liver and muscle of caribou and ringed and bearded seals, and on muscle of Arctic char (the principal items in the diet of local people), of Arctic fox, sledge dogs and wolves. About half of the 123 samples were also analyzed for methyl mercury, and some for selenium. Ringed seals showed mean total mercury levels of 27 ppm in liver and 0.73 in muscle. Bearded seals showed levels of 143 in liver and 0.53 in muscle. In the livers, methyl mercury levels were 5.6% of total in ringed seals and 0.38% in bearded seals. Positive and significant correlations of mercury content with age and body weight were found. Blood mercury levels were reported to be above average in people from this community, due to the diet. (Katz)
W75-09679

POND SNAIL EGGS AS AN INDICATORY MATERIAL FOR WATER POLLUTION BIOASSAY: PRELIMINARY EXPERIMENTS, (IN JAPANESE),
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 5C.
W75-09682

USE OF SODIUM PENTACHLOROPHENATE AND DEHYDROABIETIC ACID AS REFERENCE TOXICANTS FOR SALMONID BIOASSAYS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W75-09683

ASPECTS OF TRACE METAL CONTAMINATION IN THE COASTAL RIVERS OF ISRAEL,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 5B.
W75-09689

UPTAKE, METABOLISM AND DISTRIBUTION OF DDT IN ORGANS OF THE BLUE CRAB, CALLINECTES SAPIDUS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W75-09691

SELENIUM DETERMINATION ON FISH TISSUE,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
A. R. Beal.
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 249-252, February 1975. 2 tab, 17 ref.

Descriptors: *Heavy metals, *Analytical techniques, Equations, Laboratory tests, Methodology, *Pollutant identification, Chemical analysis.
Identifiers: *Selenium, *Tissue analysis, Wet-digestion method, Flourescence measurement, Fish tissue.

A wet-digestion procedure for selenium analysis of fish is described. It involves digestion of the fish homogenate in a nitric-perchloric-sulfuric acid mixture and subsequent complexing with 2,3-diaminonaphtalene. Interfering elements are masked with disodium (ethylene-dinitrilo)-tetraacetate prior to complexing. The slope of standards is consistent and recoveries range from 85 to 100%. (Katz)
W75-09696

DIFFERENTIATION BETWEEN NATURAL HYDROCARBONS AND LOW LEVEL DIESEL OIL CONTAMINATION IN COOKED LOBSTER MEAT,
Fisheries Research Board of Canada, Halifax (Nova Scotia). Halifax Lab.
M. Paradis, and R. G. Ackman.
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 316-320, February 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Lobsters, *Commercial shellfish, *Organoleptic properties, *Organic compounds, *Oil pollution, *Water pollution effects, *Laboratory tests, *Analytical techniques, Chromatography, Gas chromatography, *Pollutant identification.
Identifiers: *Cooked lobster, Tissue analysis, Lipid extraction.

A combination of total lipid extraction, column chromatography and temperature-programmed gas chromatography was required to demonstrate disputed low level diesel oil contamination in cooked lobster meat. A specific diesel oil contaminant was indicated, but identifiable components were not greatly in excess of the same compounds which were also found to be a normal background in organoleptically acceptable canned lobster meat. (Katz)
W75-09698

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2A.
W75-09718

CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 5B.
W75-09719

OCCURRENCE OF PESTICIDE RESIDUES IN FOUR STREAMS DRAINING LAND-USE AREAS IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5B.
W75-09720

AVAILABILITY OF GROUND WATER IN THE BRANCH RIVER BASIN, PROVIDENCE COUNTY, RHODE ISLAND,
Geological Survey, Providence, R.I.
For primary bibliographic entry see Field 2F.
W75-09721

AUTOMATION IN A WATER QUALITY LABORATORY SCHEME,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
R. L. McAvoy.
In: Advances in Automated Analysis; Proceedings of Technicon International Congress, June 12-14, 1972, New York, NY, p 37-42, 1972. 1 fig, 4 tab.

Descriptors: *Water analysis, *Chemical analysis, *Laboratories, *Automation, Laboratory equipment, Laboratory tests.

In 1970, the Water Resources Division of the U.S. Geological Survey reorganized water quality laboratory activities in the western United States. Central Laboratory is designed to integrate manpower and machinery as a single system to produce its work. The operation of the Central Laboratory during the first year was a success. The workload during the period was about 75% above the planned level. The daily sample input to the laboratory averaged 56 per day and varied from 20 to 150. Residence time of samples in the laboratory during the later part of the test year was no more than 5 days and with priority scheduling was in the order of 1 to 2 days. Complex analyses requiring 60 to 70 tests can be processed in about 3 days, routinely. The mode of operation reduces most analyst bias from the analytical results and increases the accuracy and precision of the results. Productivity per man in the semiautomated laboratory is from 200% to 300% of nonautomated laboratories. (Knapp-USGS)
W75-09723

GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W75-09727

WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 7C.
W75-09729

EVALUATION OF SAMPLE PREPARATION TECHNIQUES FOR ALGAL BIOASSAYS,
Utah Water Research Lab., Logan.
D. S. Filip, and E. J. Middlebrooks.
Water Research, Vol 9, No 5/6, p 581-585, May-June 1975. 4 fig, 2 tab, 4 ref.

Descriptors: *Sampling, *Pollutant identification, *Algae, *Bioassay, *Evaluation, *Water analysis, Analytical techniques, Chemistry, Chemical oxygen demand, Eutrophication, Organic matter, Water quality, Farm wastes, Ultraviolet radiation, Phosphorus, Nutrients, Nitrates, Biological properties, Ponds, Feed lots, Runoff, Autoclaves, Membranes, Filtration.
Identifiers: *Sample preparation techniques, Biostimulatory properties, Pasturization, Glass fiber filtration.

The chemical and biostimulatory properties of mesotrophic pond water and eutrophic feedlot runoff were examined after subsamples of each were separately subjected to standard membrane filtration and autoclaving pretreatments for bottle test bioassays. Correspondingly separate subsamples were exposed to ultraviolet light to determine its effectiveness as a possible pretreatment. All three pretreatments fulfilled the requirement of destroying or removing indigenous algae, but each technique substantially altered the water chemistry changing the bioassay results. Filtration removed phosphorus; autoclaving raised the pH value, precipitated salts, and eliminated dissolved carbon dioxide; and ultraviolet light oxidized organic and inorganic nitrogen compounds. (Henley-ISWS)
W75-09734

AUTOMATIC U.V.-CONTROL SYSTEM FOR RELATIVE EVALUATION OF ORGANIC WATER POLLUTION,
Vyzkumny Ustav Vodohospodarsky, Ostrava (Czechoslovakia).
M. Mrkva.
Water Research, Vol 9, No 5/6, p 587-589, May-June 1975. 6 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Ultraviolet radiation, *Analytical techniques, *Instrumentation, *Biochemical oxygen demand, Waste identification, Spectrophotometry, Chemistry, Evaluation, Testing, Phenols, Lignins, Humus, Organic wastes, Turbidity, Water quality, Organic matter, Municiple wastes, Industrial wastes.
Identifiers: *Ultraviolet analyzer, *Automatic analyzer, *Flow-through analyzer, Permanganate oxygen demand, Dichromate oxygen demand.

A correlation exists between ultraviolet absorbance at 254 nm and the organic content of some surface and waste water samples. With this in mind, an ultraviolet analyzer was constructed for obtaining continuous absorbance measurements. The instrument was tested in rivers containing organic pollution and in effluents from municipal and industrial sewage plants. During the second part of the investigation, an ultraviolet analyzer was tested that automatically compensates for turbidity. With these instruments, changes in the organic content of a water may be noted immediately and corrective action taken. Conversion factors relating absorbance and chemical oxygen demand for some waters were shown. (Henley-ISWS)
W75-09735

ADENOSINE TRIPHOSPHATE MEASUREMENTS IN SOIL AND MARINE SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
D. M. Karl, and P. A. LaRock.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 599-607, May 1975. 7 fig, 2 tab, 35 ref. NASA Grant NGR-10-004-041.

Descriptors: *Pollutant identification, *Phosphates, *Analytical techniques, Marine biology, Instrumentation, *Phosphorus compounds, Soils, Sedimentation, Estimating, Evaluation, Chemistry, Phosphorus, Analysis, Organophosphorus compounds, Sediments, Laboratory tests, Biomass, Microbiology, Separation techniques, Enzymes.
Identifiers: *Adenosine triphosphate, *Marine sediments, *Sulfuric acid-EDTA method, Bioluminescent reaction, Liquid scintillation counter, Triss method.

A sulfuric acid-EDTA method for extracting ATP from soil and marine sediments was devised. The efficacy of this method was compared to the boiling Tris extraction procedure. Efficiency of ATP recovery from solid substrates typically ranged between 81-94% for the sulfuric acid-EDTA procedure in comparison to a recovery of 3-6% for the boiling Tris buffer. The presence of various ions in the acid extract, however, inhibited light emission in the luciferin-luciferase measurement of ATP. Addition of EDTA to the extract reduced but did not eliminate the ionic interference. An internal ATP standard was thus used to determine the magnitude of the residual interference. (Henley-ISWS)
W75-09764

PICK UP AND METABOLISM OF DDT, DIELDRIN AND PHOTODIELDRIN BY A FRESHWATER ALGA (ANKISTRODESMUS AMALLOIDES) AND A MICROCRUSTACEAN (DAPHNTA PULEX),
Illinois Univ., Chicago. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W75-09805

PESTICIDES IN FISH FROM A HAWAIIAN CANAL,
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
C. D. Shultz, W. L. Yauger, Jr, and A. Bevenue.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 206-208, February 1975. 2 tab, 7 ref.

Descriptors: *Pesticide residues, *DDT, *DDD, *DDE, *Dieldrin, *Canals, *Hawaii, Pesticides, Environmental effects, Domestic wastes, Food chains, Algae, Water pollution sources, Absorption, Path of pollutants, Pollutant identification.
Identifiers: Elops hawaiensis, Chanos chanos, Bioaccumulation, Tissue analysis.

Samples of sediment, water and biota were taken from a canal that receives drainage from streams that pass through residential Honolulu and runoff from a golf course to determine the degree of pesticide contamination. No PCB's were found in any of the samples; DDT and its metabolites were found in different concentrations in the Ten Pounder (Elops hawaiensis), a carnivore, and milkfish (Chanos chanos), a plankton feeder. The data suggest that small fish accumulate DDT more efficiently than large fish and that algae are efficient accumulators of pesticide residues, contributing residues to fish in waters containing trace amounts of pesticides. (Katz)
W75-09806

LOSS OF FIVE PESTICIDES FROM CULTURES OF TWENTYONE PLANKTONIC ALGAE,
Syracuse Univ. Research Corp., N.Y. Life Science Div.
G. L. Butler, T. R. Deason, and J. C. O'Kelley.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 149-152, February 1975.

Descriptors: *Bioassay, *Algae, *2,4-D, *Pesticides, *Metabolism, *Plankton, *Diazinon, Laboratory tests, Chlorinated hydrocarbon pesticides, Organophosphorus, Absorption, Adsorption, Chemical analysis, Pesticides, Gas chromatography, Pollutant identification, Water pollution effects.
Identifiers: *Atrazine, *Carbaryl, *Methoxychlor.

The loss of atrazine, carbaryl, methoxychlor, diazinon and 2,4-D from actively growing cultures of planktonic algae was used as an indication of metabolic breakdown of the pesticides by algae. Some of the cultures were able to remove significant amounts of diazinon, 2,4-D or methoxychlor but not atrazine. Results indicate which strains of algae may be utilized in experiments determining whether uptake is by absorption or adsorption. (Katz)
W75-09808

DIFFERENTIAL UPTAKE OF ENDOSULFAN BY THE TISSUES OF MYTILUS EDULIS,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
D. Roberts.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 170-176. February, 1975. 2 fig, 14 ref.

Descriptors: *Absorption, *Adsorption, *Mussels, *Pesticides, *Bioassay, Pesticide residues, Laboratory tests, Pollutant identification, Water pollution effects.
Identifiers: *Bioaccumulation, *Mytilus edulis, *Endosulfan, *Tissue analysis.

Assimilation of Endosulfan could result from direct absorption across exposed tissue surfaces or by ingestion of the pesticide adsorbed on particulate matter in bivalves the path of entry was predicted to be via the gills to the digestive gland. The gills of Mytilus edulis did not assimilate Endosulfan to the levels recorded for the digestive gland and the rise to the maximum level was slower. The digestive gland retained the highest residue level of all tissues, suggesting that it is the major site of Endosulfan assimilation. Assimilation of pesticide into the gonad, mantle and remaining tissues was determined to be via body fluids rather than direct absorption. (Katz)
W75-09810

5B. Sources Of Pollution

FOREST FIRE: EFFECT ON PHOSPHORUS MOVEMENT TO LAKES,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
J. G. McColl, and D. F. Grigal.
Vol 188, No 4193, p 1109-1111, June 13, 1975. 2 tab, 15 ref.

Descriptors: *Lakes, *Phosphorus compounds, *Forest watersheds, *Forest fires, *Runoff, Forest management, Pollutants, Water pollution sources, Water pollution, Forest, Burning, Watershed management, *Minnesota, Lumbering, *Path of pollutants.
Identifiers: Controlled burn.

After a wildfire in the virgin forest of a lake-watershed region in northeastern Minnesota, the phosphorus concentration in the runoff was elevated for 2 years and decreased in the third year. However, there was no increase in the phosphorus concentration of a lake and its input stream. This indicates that, under similar circumstances, controlled burning will not damage streams or lakes by elevating phosphorus levels. (Witt-IPC)
W75-09364

MEASURING FLOW OF POLLUTED EFFLUENTS (POUR LA MESURE DU DEBIT DES EFFLUENTS POLLUES).
For primary bibliographic entry see Field 5A.
W75-09370

WASTEWATER SURVEY, CHANUTE AFB, ILLINOIS.
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5D.
W75-09397

SURVEY OF WASTEWATER DISCHARGE--ELMENDORF AFB, ALASKA,
Environmental Health Lab., Kelly AFB, Tex.
J. F. Thomas, and C. F. Pauls.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-782 480. $4.75 in paper copy, $2.25 in microfiche. Report EHL(K)74-11, July, 1974. 11 p, 9 ref, 5 append.

Descriptors: *Surveys, Waste water, *Waste disposal, *Waste water treatment, Sampling, Analysis, Water quality standards, *Alaska, *Path of pollutants, Water pollution sources, Water pollution control.

A waste water survey was conducted at Elmendorf AFB, Alaska during the period of June 16-22, 1972. Waste water sources, discharge routes and treatment processes were evaluated. Recommendations were made for future handling of wastes from specified operations. Additional recommendations were made regarding fungicides used on the golf course and storage and disposal of waste lubricating oils, fuels and solvents. A sampling and analysis program was outlined to comply with applicable water quality standards. (Prague-FIRL)
W75-09398

SURVEY OF WASTEWATER DISCHARGE, CAMPION AFS, ALASKA,
Environmental Health Lab., Kelly AFB, Tex.

For primary bibliographic entry see Field 5D.
W75-09413

DISINFECTION OF SOIL STRIPS THROUGH THE DRIP IRRIGATION SYSTEM,
Hebrew Univ., Rehovth (Israel).
For primary bibliographic entry see Field 5G.
W75-09444

CLOGGING OF DRIP SYSTEMS FROM METABOLIC PRODUCTS OF IRON AND SULFUR BACTERIA,
Agricultural Research and Education Center, Lake Alfred, Fla.
H. W. Ford, and D. P. H. Tucker.
In: Proceedings of the Second International Drip Irrigation Congress, p 212-214, (1974).

Descriptors: *Clogging, *Iron bacteria, *Sulfur bacteria, Irrigation, Agriculture, Path of pollutants, *Water pollution sources.
Identifiers: *Trickle irrigation, *Drip irrigation.

Numerous drip irrigation systems have been installed in central and south Florida citrus groves. Many have ceased to function properly because of filter and emitter clogging. The most serious clogging, involving water from shallow and deep wells, has been found associated with a sulfur bacteria. The long filamentous bacteria, stuffed with sulfur from the oxidation of hydrogen sulfide within the irrigation pipes, clog all small openings within a brief period of time. The white, slimy organic-sulfur-iron mass can only be dissolved in pyridine. Another serious clogging factor, from wells containing traces of ferrous iron, has been a filamentous gelatinous iron deposit (ochre) caused by iron bacteria. The sticky sludge adheres to filters and the grooves and orifices of emitters. (See also W75-09423) (Skogerboe-Colorado State)
W75-09456

USE OF GLYCEROPHOSPHATE FOR FERTILIZATION THROUGH TRICKLE IRRIGATION SYSTEMS,
California Univ., Davis.
D. E. Rolston, D. L. Hoffman, and R. S. Ravschkolb.
In: Proceedings of the Second International Drip Irrigation Congress, p 416-421, (1974). 3 fig, 9 ref.

Descriptors: *Fertilization, *Fertilizers, *Phosphorus, Irrigation practices, Irrigation systems, Irrigation, Agriculture, Phosphates, Path of pollutants.
Identifiers: *Trickle irrigation, *Drip irrigation, *Glycerophosphate.

There is little doubt after 60 years of scientific investigation with several sources of inorganic phosphate that phosphorus moves very little from point of contact with the soil. The greatest successes in measuring increased movement of phosphorus in the soil profile have occurred with organic forms of phosphorus. The development of new cultural management techniques such as trickle irrigation make the use of a water-soluble, non-corrosive, high analysis source of organic phosphorus an especially desirous material. A material with this capability would be of great value where trickle systems make it extremely difficult to achieve placement by mechanically injecting phosphorus below the soil surface. The movement and sorption of glycerol phosphate was studied in unsaturated soil columns during steady-state displacement of a fertilizer pulse. Fertilizer pulses equivalent to 90 kg/ha application rates were displaced at flow rates between 5 and 15 cm/day. Results demonstrate that glycerol phosphate is capable of being displaced to much greater depths than inorganic forms of phosphorus fertilizer. It is expected that glycerol phosphate can be applied through a trickle irrigation system and be distributed within the wetted root zone. (See also W75-09423) (Skogerboe-Colorado State)
W75-09492

EVALUATION OF RECOVERY IN A POLLUTED CREEK AFTER INSTALLATION OF NEW SEWAGE TREATMENT PROCEDURES,
Kentucky Water Resources Inst., Lexington.
R. A. Kuehne.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 499, $3.75 in paper copy, $2.25 in microfiche. Research Report No 85, May 1975. 33 p, 1 fig, 8 tab, 12 ref. OWRT A-047-KY(1). 14-31-0001-3817, 14-31-0001-4017.

Descriptors: *Water pollution, *Streams, *Sewage lagoons, Invertebrates, Fish, *Kentucky, *Sewage treatment, Waste water treatment, Evaluation, Path of pollutants.
Identifiers: *Pollution recovery, Stream order, *Hickman Creek(Kent).

Response of Hickman Creek near Lexington, Kentucky to alleviation from serious sewage pollution was studied from January, 1973 through July, 1974. Wastes are now handled from an efficient secondary treatment facility and four sequential polishing lagoons before chlorination and discharge to West Hickman branch. Physicochemical tests gave no strong indication of residual pollution effects at the start of the study, approximately six months after the treatment facility opened. At low flow a slight oxygen sag, probably associated with algal growth in the lagoons, persists downstream from the outfall. Mean values for turbidity, nitrates and COD are somewhat higher at the outfall than at eleven stations within the basin. Orthophosphates are considerably higher in lagoon discharge than elsewhere in the system, which gains some phosphate from bedrock. While the lagoons place some oxygen demand on West Hickman in the form of unicellular algal growth, they can and do receive surges of input that cannot be accommodated in the treatment plant. They would serve as a buffer to the stream in case of operational malfunction, which could overwhelm the small stream at low flow. The lagoons provide some benefits of tertiary treatment. (Huffsey-Kentucky)
W75-09515

WATER QUALITY STUDY OF NONPOINT SOURCE OF AGRICULTURAL RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
D. R. Andersen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 552, $3.25 in paper copy, $2.25 in microfiche. Completion Report, July 1975. 19 p, 7 fig, 2 tab, 6 ref.

Descriptors: Path of pollutants, Simulation analysis, *Agricultural runoff, *Water quality, *Model studies, Water pollution sources, *Instrumentation, Agricultural watersheds, *Monitoring, *Nebraska.
Identifiers: *Non-point source pollution.

A 7.8 square mile agricultural drainage area was instrumented and monitored for the purpose of obtaining data from an intermediate sized watershed for evaluating available modeling techniques for simulation of the quantity and quality of non-point source agricultural runoff. The study watershed, Dee Creek, is located approximately 15 miles northeast of Lincoln, Nebraska. Instrumentation of the watershed was completed on July 1, 1974. However, due to severe drought conditions, only one runoff event occurred during the last six months of 1974. Samples were collected, during this runoff event for determining various water quality parameters such as solids, phosphorus, nitrogen and chemical oxygen demand. Additional samples were collected of the base flow on a weekly basis and the pH, temperature, dissolved oxygen and conductivity of the stream were monitored on a continuous basis during warm weather. Depth of flow at the control structure where the samples were collected was continuously recorded. However, because of limited runoff in 1974, necessary velocity measurements for calibrating the stream at this point were not completed until June 1975. As a result, limited progress was made relative to evaluation of existing modeling techniques.
W75-09519

POLLUTION OF IRRIGATION WATERS BY PLANT PATHOGENIC ORGANISMS,
Nebraska Univ., Lincoln. Dept. of Plant Pathology.
J. R. Steadman.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 504, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 26 p, 7 fig, 3 tab, 3 ref. OWRT B-021-NEB(1). 14-31-0001-3907.

Descriptors: *Irrigation water, Pollution, Epidemiology, Pathogenic bacteria, *Nebraska, Nematodes, Pathogenic fungi, *Fungi, *Bacteria, *Path of pollutants, Water pollution control.
Identifiers: *Phytopathogenic bacteria, *Phytopathogenic fungi, *North Platte Project(Neb), Xanthomonas phaseoli, Whetzelinia sclerotiorum.

Systematic sampling of waterways and irrigation runoff from agricultural lands in the North Platte Project of Nebraska in July and August of 1972-1974 demonstrated that phytopathogenic organisms were disseminated. The organisms monitored included the bean common blight bacterium Xanthomonas phaseoli, the bean white mold fungus Whetzelinia sclerotiorum and various nematodes. Patterns of movement of the bacterial and fungal organisms were correlated with previous or current season infection of bean plants. The short-term survival of X. phaseoli in flowing water or filution effects may explain the detection of this organism only in runoff or ditches receiving runoff from common blight-infected bean fields. Sclerotial bodies of W. sclerotiorum remained viable for at least 10-21 days in flowing water and were found throughout the irrigation waterways. Irrigation of beans with contaminated water can result in both common blight and white mold diseases. Sedimentation in a settling basin was not efficient or practical as a method of minimizing this type of organismal pollution. Use of cleaners to remove debris from headwater sources in combination with a method such as chlorination is a promising control. Dissemination of phytopathogenic organisms in irrigation reuse systems as well as agricultural land runoff should be considered in irrigation planning and system designs.
W75-09521

MOVEMENT OF POLLUTANT PHOSPHORUS IN UNSATURATED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 509, $3.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 46, June 1974. 41 p, 8 fig, 5 tab, 224 ref. OWRT A-021-IND(5).

Descriptors: *Phosphates, *Nutrient removal, *Waste water disposal, *Unsaturated flow, *Soil moisture tension, Soil water movement, Land disposal, Porosity, Radioisotopes, Water pollution sources, Chemical wastes, *Path of pollutants, Phosphorus.
Identifiers: Freundlich equation, Langmuir equation.

The primary objective was to determine the functional relationship between soil, soil water content and phosphorus concentration capacities in a laboratory system similar to the irrigation of waste water on land. Various concentrations of potassium phosphate solution were admitted to short soil columns on reaction chambers. The phosphate solution also contained a radioactive tracer which

was chemically the same as the major portion of the solute. After reaction with a given soil mixture, the effluent was collected at known time intervals and the amounts of phosphate removed for the time intervals were determined. The Freundlich and Langmuir isotherm equations did not account for differences in soil water pressure and being equilibrium equations neither did they account for time at equilibrium. An exponential equation similar to that of Freunlich is proposed in which soil water pressure as well as time are taken into account. As expected, clay content of the soil influenced the amount of phosphorus adsorbed from the inlet solution. Also of significance was the inlet phosphate concentration and soil water pressure. In an unsaturated state, soil water pressure tends to drain the large soil pores first and the flow lines are diverted into the small pores where more adsorptive surfaces are available.
W75-09527

SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 553, $4.75 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center, Technical Report No 53, February 1975. 83 p, 13 fig, 11 tab, 45 ref, append. OWRT B-042-IND(4).

Descriptors: *Multiple-purpose projects, *Water pollution source, *Forest management, *Erosion control, Clear cutting, Plant management, Vegetation regrowth, Land use, Linear programming, Leontief model, Input-output analysis, Soil erosion, Discount rates, Regional analysis, *Indiana, Economic impact.
Identifiers: *Non-point source pollution, Soil losses, Lincoln Hills(Ind).

This is a case study of a forested area in Southern Indiana known as the Lincoln Hills. The direct economic and environmental impacts (soil erosion losses) of a forest resource development project were measured, and their relationship illustrated. Also the indirect economic impact was measured at various levels of resource development. Two techniques of analysis were used, linear programming and Leontief static input-output. Consideration was given to soil erosion control, the rate and manner in which timber is harvested, and the uses to which newly cut timber are put. The control of soil losses has an inverse effect both directly and indirectly on the economy of the area. The rate of harvest should be programmed over time to achieve the highest net benefit. Policy makers should encourage the utilization of the timber by industries in the area for increased income, employment and economic development of the area. (Wiersma-Purdue)
W75-09530

WATER QUALITY EFFECT OF DIKING A SHALLOW ARID-REGION LAKE,
Brigham Young Univ., Provo, Utah.
D. K. Fuhriman, L. B. Merritt, J. S. Bradshaw, and J. R. Barton.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Ada, Oklahoma, Report EPA-660/2-75-007, April 1975. 234 p, 7 fig, 9 tab, 28 ref. 1BB045 (ROAP 21-ACC, Task 10). R-801400 (Formerly 16080 EVT). Final (6/1/70 - 6/30/74).

Descriptors: *Lakes, Dikes, *Water quality, Utah, Evaporation, Seepage, Arid lands, Sodium, Chlorides, Dissolved solids, *Computer models, Management, Water conservation, Land reclamation.
Identifiers: *Lake diking, Shallow lakes, *Utah Lake(Utah).

The inflow, outflow, and in-lake water quality and quantity of Utah Lake in Central Utah were studied over a 36-month period, to determine the effect of a proposed diking project and to develop methodology for determining the effect of diking or other management practices on the quality of water in any lake system. A computer simulation model was developed which is able to analyze the effect of a given management program on the water quality of the lake, particularly as related to the 'conservative salts' present. The simulation model was also used to evaluate the evaporation from the lake by use of a salt balance technique. Results of the research indicate that the diking of Utah Lake will have a positive beneficial effect upon the water quality of the lake and will also result in considerable saving of water and reclamation of valuable land. (EPA)
W75-09577

STATE-OF-THE-ART FOR THE INORGANIC CHEMICALS INDUSTRY: COMMERCIAL EXPLOSIVES,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
J. W. Patterson, and R. A. Minear.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/2-74-009b, March 1975. 80 p, 10 fig, 21 tab, 32 ref. 1BB036 R/T 21 AZQ 29. R-800857.

Descriptors: *Explosives, *Chemical industry, *Inorganic compounds, Chemical wastes, Reviews, Water pollution control, Pollution abatement, Water pollution sources, *Industrial wastes.
Identifiers: Waste characteristics.

A literature and field study was made of the commercial explosives industry on the basis of products manufactured, plant size, and the nature of the wastewater, the industry may be divided into three segments. One, complex facilities, are large plants manufacturing a variety of explosives and intermediate products. The second category is small specialized formulation plants, typically limited to blending explosives formulations for use in nearby mining activities. The final category is specialty product facilities, devoted to manufacture of select ingredients such as lead azide and other explosives initiators, blasting caps, electric matches and similar appurtenance items. The explosives industry discharges large volumes of wastewater, typically high in BOD, nitrogen, and solids, frequently at extreme pH, and containing trace to high quantities of dissolved and particulate explosives products. Although pollution abatement technology has not been widely implemented within the explosives industry, there is potential for significant abatement of pollutant discharge by good housekeeping practice, application of proven treatment technology and under certain conditions total wastewater containment. (EPA)
W75-09581

RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5G.
W75-09587

URBAN LAWN INFILTRATION RATES AND FERTILIZER RUNOFF LOSSES UNDER SIMULATED RAINFALL,
Ball State Univ., Muncie, Ind. Dept. of Natural Resources.
K. A. Kelling, and A. E. Peterson.
Soil Science Society of American Proceedings, Vol 39, No 2, p 348-352, March-April, 1975. 1 fig, 4 tab, 25 ref.

Descriptors: *Path of pollutants, *Urban runoff, *Fertilizers, *Water pollution sources, *Infiltration, *Rainfall-runoff relationships, Nutrients, Pollutants, Vegetation effects, Storm runoff, Eutrophication, Soil-water-plant relationships, Soils, Infiltrometers, Surface waters, Simulated rainfall.

Infiltration runoff measurements were made on nine urban lawns by using a sprinkling infiltrometer in conjunction with the application of a complete fertilizer at three rates. The amounts of inorganic N, P, and K removed with the runoff water were determined. Results of the infiltration measurements show that the presence of textural and compaction discontinuities within the soil profile, formed during building and lawn construction, was probably the greatest factor affecting infiltration. Where these discontinuities were distinct, water intake was reduced to about 35% of that for a lawn with an undisturbed profile. For lawns with similar infiltration characteristics, a first order relationship appeared to exist between amounts of fertilizer applied and amounts lost. A second order equation, however, best described the relationship between percent of applied fertilizer in the runoff and 90-min cumulative infiltration. When the simulated storm was applied immediately after fertilizer application, fertilizer losses averaged 10.6%; however, when fertilizer application was followed by recommended watering before the intense storm, average losses were reduced to 1.7% of the amount applied. (Terstriep-ISWS)
W75-09592

INTERACTION BETWEEN THE DAILY HEAT BALANCE AND THE TIDAL CYCLE,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
H. F. Vugts, and J. T. F. Zimmerman.
Nature, Vol 255, No 5504, p 113-117, May 8, 1975. 5 fig, 1 tab, 4 ref.

Descriptors: *Thermal pollution, *Heat balance, *Tidal effects, *Oceans, *Tidal waters, Mathematical studies, Mathematical models, Theoretical analysis, On-site investigations, Currents(Water), Water temperature, Meteorological data, Tides, Temperature distribution, Diurnal, Evaluation, Variability, Mud flats, Frequency.
Identifiers: *Dutch Wadden Sea.

Knowledge of the heat balance and temperature cycle of a tidal-flat sea is relevant to the biology of these areas; temperature is one of the most important physical factors in its ecosystem. Moreover, in planning power stations which will discharge heated effluents in areas of tidal flats, the special character of the heat balance should be taken into account. In a sea area consisting partly of periodically drying tidal flats, the semidiurnal lunar tide, interacting with the daily variation of solar radiation, gives rise to both a beat in the amplitude of the daily water temperature cycle with a period of 14.76 d and a variation of the daily mean temperature with the same period. This is shown theoretically and by observation. Extenstive surveys of temperature fluctuations were made in the Dutch Wadden Sea. Analysis of these data showed that a qualitative agreement exists between the developed theory and field measurements. (Humphreys-ISWS)
W75-09602

CHEMICAL TRANSPORT BY THE MEKONG RIVER,
Paris-6 Univ. (France). Laboratoire de Geologie Dynamique.
M. Meybeck, and J. P. Carbonnel.
Nature, Vol 255, No 5504, p 134-136, May 8, 1975. 1 fig, 3 tab, 20 ref.

Descriptors: *Path of pollutants, *Pollutant identification, *Rivers, *Water quality, *Asia, Ion transport, Dissolved solids, Ions, Metals, Calcium, Magnesium, Potassium, Sodium, Silica, Sulfates, Nitrates, Chlorides, Data collections,

Sampling, Analysis, Bicarbonates, Chemical properties.
Identifiers: *Phnom Penh(Mekong River), *Cambodia.

Major rivers are important for an understanding of the overall balance of dissolved and particulate matter carried to the ocean. The Mekong River in Phnom Penh, Cambodia, has a basin area of 663,000 sq km (83% of the total drainage area) and a mean annual discharge of 14,900 cu m/s. At the Phnom Penh station, between January 1961 and December 1962, 546 daily water samples were taken in which temperature, pH, and conductivity were measured. Once a month a complete water analysis was performed. Tabulated values of water quality variation along the Mekong River and dissolved transport rate for SiO2, Ca(2+), Mg(2+), Na(+), K(+), Cl(-), SO4(2-), HCO3(-), and NO3(-1) were given. The total ionic transport for 1961-1962 was 68.5 tons/sq km/yr. This value can be taken as a fair average since the water discharge during this period was 14,970 cu m/s, which is very close to the mean annual discharge. The total dissolved mineral transport rate was 74.8 tons/sq km/yr. (Humphreys-ISWS)
W75-09603

THE QUALITATIVE AND QUANTITATIVE DETERMINATION OF SOLUBLE AND INSOLUBLE FORMS OF PHOSPHORUS IN SEWAGE TREATMENT PLANTS,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5D.
W75-09618

ACUTE TOXICITY OF NITRITE TO RAINBOW TROUT (SALMO GAIRDNERI),
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
For primary bibliographic entry see Field 5C.
W75-09687

ASPECTS OF TRACE METAL CONTAMINATION IN THE COASTAL RIVERS OF ISRAEL,
Hebrew Univ., Jerusalem (Israel).
J. Kronfeld, and J. Navrot.
Water, Air and Soil Pollution, Vol 4, No 1, p 127-134, March 1975. 3 fig, 1 tab, 9 ref.

Descriptors: *Trace elements, *Heavy metals, *Water pollution sources, *Sediments, Wastes, *Metals, Soil chemical properties, Environmental effects, Sewerage, Industrial wastes, Chemical wastes, Groundwater, Permeation, Sampling, Soil analysis, Cadmium, Cobalt, Copper, Cadmium, Nickel, Lead, Mercury, Zinc, Public health.
Identifiers: *Israel, Aquatic balance, Ayyalon River, Gadura River, Qishon River Hader River(Israel).

Nine trace elements of biological concern: Cr, Co, Cu, Cd, Ni, Pb, Hg, Zn, and Ag were investigated in the sediments of coastal streams in Israel. The Ayyalon, Gadura, Qishon and Hadera rivers contain sediments exhibiting sever pollution effects due to domestic and/or industrial sewage. The danger of infiltration through soils into the groundwaters and exposure of nearshore fauna to sediments contaminated by possibly toxic trace metals is disscussed as well as high Pb and Zn levels near major highways. (Katz)
W75-09689

DEPOSITION OF ZINC AND CADMIUM BY MARINE BACTERIA IN ESTUARINE SEDIMENTS,
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 5C.
W75-09692

FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W75-09703

EFFECTS OF METAL-MINE DRAINAGE ON WATER QUALITY IN SELECTED AREAS OF COLORADO, 1972-73,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5C.
W75-09712

WATER-RESOURCES INVESTIGATIONS IN THE FORT UNION COAL REGION, NORTH DAKOTA, 1974-75.
Geological Survey, Bismarck, N.Dak.
Open-file report, January 1975. 42 p, 10 fig.

Descriptors: *Water pollution sources, *Coal mine wastes, *Water quality, *North Dakota, Reviews, Project purposes, Publications, Surface waters, Groundwater, Water pollution effects, Water pollution control, Hydrologic data, Data collections, Bibliographies.
Identifiers: *Fort Union coal region(N Dak).

Owing to the current emphasis on energy development, a rather large number of geologic and hydrologic studies either are underway or are proposed by a number of agencies and private companies working in the Fort Union coal region of North Dakota. The purpose of this report is to inform other agencies, private companies, and the public in general of the on-going and recently completed work by the Water Resources Division of the U.S. Geological Survey in the Fort Union coal region. The work done by the Water Resources Division in North Dakota is listed by sequential project identification number. Some of the projects are primarily concerned with data collection. Others involve interpretation in addition to data collection. A summary of each project includes objectives, cooperators, and availability of the report. (Woodard-USGS)
W75-09715

CHANGES IN CHEMICAL QUALITY OF WATER, CEDAR BLUFF IRRIGATION DISTRICT AREA, WEST-CENTRAL KANSAS,
Geological Survey, Lawrence, Kans.
R. B. Leonard.
Kansas State Geological Survey, Lawrence, Chemical Quality Series No 1, April 1975. 72 p, 37 fig, 3 plate, 12 tab, 45 ref.

Descriptors: *Water quality, *Irrigation water, *Chemical analysis, *Irrigation effects, *Kansas, Hydrologic data, Data collections, Sampling, Surface waters, Groundwater, Soil analysis, Inorganic compounds, Pesticides, Water levels, Discharge(Water), Well data.
Identifiers: *Cedar Bluff area(Kans), Water quality changes.

The Cedar Bluff Irrigation District in west-central Kansas diverts water from the Smoky Hill River to irrigate about 6,000 acres. Although drainage from irrigated land replenishes groundwater in transient storage and augments low flow in the river, the drainage adversely affects the chemical quality of the related water. Specific conductance of the irrigation water increased progressively from 800 to 980 micromhos per centimeter at 25 deg C between 1964 and 1971. The percent composition of this calcium-sulfate type water remained relatively constant. The use of water for irrigation in the district and the increase of drainage to low flow have not caused serious degradation of chemical quality of the Smoky Hill River. The data include measurements of precipitation, water levels and water discharge; lithologic and gamma-ray logs of observation wells and test holes; chemical analyses of groundwater, surface water, and soil; analyses for pesticides in ground and surface water; and selected particle-size analyses of soil. (Woodard-USGS)
W75-09719

OCCURRENCE OF PESTICIDE RESIDUES IN FOUR STREAMS DRAINING LAND-USE AREAS IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
J. F. Truhlar, and L. A. Reed.
Available from NTIS, Springfield, Va 22151 as PB-242 770/AS, $3.75 in printed copy; $2.25 in microfiche. Water-Resources Investigations 6-75, June 1975. 23 p, 5 fig, 5 tab, 7 ref.

Descriptors: *Water pollution sources, *Pesticides, *Insecticides, *Pennsylvania, Surface waters, Fish, Soils, Land use, Sampling, Chemical analysis, DDT, Dieldrin, Agricultural chemicals, Orchards.

Samples of water, bed material, fish, and soil were collected in four small drainage basins in Pennsylvania in 1969-71 and analyzed to determine the concentrations of chlorinated-hydrocarbon insecticides. Water samples only were also analyzed for phenoxy-acid herbicides. Each basin studied represents a predominant land-use classification--forested, general farming, residential, and orchard farming. All water and fish samples showed pesticide concentrations less than the U.S. Public Health Service's (1969) recommended maximum permissible concentration. However, no fish were found in the orchard area stream at the time collection was attempted. DDT or one of its metabolites was the most frequently occurring insecticide and was detected in all media sampled except the forested-area soil. The highest observed combined concentration of DDT and its metabolites in storm-runoff samples was 11.4 micrograms per litre in a sample collected from the residential area stream, but the median was higher (0.12 microgram per litre) in the orchard area than in the residential area (0.02 microgram per litre). Dieldrin was the second most frequently occurring insecticide. Other insecticides detected were chlordane, heptachlor epoxide, lindane, and a trace of aldrin in one fish sample. (Woodard-USGS)
W75-09720

SEDIMENT RESUSPENSION AND DEPOSITION IN NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 2L.
W75-09736

A CASE STUDY OF MINE WATER QUALITY DETERIORATION, MAINSFORTH COLLIERY, COUNTY DURHAM,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil and Structural Engineering.
T. Cairney, and R. C. Frost.
Journal of Hydrology, Vol 25, No 3/4, p 275-293, May 1975. 9 fig, 2 tab, 10 ref.

Descriptors: *Water quality, *Acid mine water, *Coal mines, *Dewatering, Pyrite, Iron bacteria, Shafts(Excavations), Groundwater, Oxidation, Pumping, Leaching, Water levels, Limestones, *Water pollution, Water quality control.
Identifiers: *Great Britain, *Magnesian limestone, Mineralization, Continuous pumping, Off-peak pumping.

Little work is directed to the causes of water quality deterioration when flooding of deep coal mines occurs. The present research suggested that while the usually accepted factors - the presence of iron disulphides, oxygen, and water - are essential controls, the pumping regime in operation is also of prime importance. It was argued that significantly less polluting discharges can be achieved when the mine water is held at a constant level. (Visocky-ISWS)
W75-09752

RAPID TEMPERATURE REDUCTION OF THERMAL DISCHARGE,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
R. D. Townsend, and D. L. Egar.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers. Vol 101, No HY5, Paper 11312, p 529-541, May 1975. 9 fig, 8 ref, 2 append.

Descriptors: *Temperature, *Hydraulic jump, *Laboratory tests, *Mixing, *Thermal pollution, Model studies, Diffusion, Open channel flow, Hydraulics, Discharge(Water), Thermal powerplants, Effluents, Outlet works, Heating, Waste dilution.

A laboratory model study was conducted to investigate increasing the rate of temperature reduction by optimizing the mixing process between a heated effluent stream and a cool, tempering water flow introduced on the side of the discharge channel. The oblique hydraulic jump was used as the mixing agent. The results were compared with the standard dilution method in which the cooler stream is entrained by jet-induced turbulence. The standard techniques for predicting the location of the jump proved inadequate in the study configuration. Temperature distributions were observed throughout the flow field in order to determine mixing efficiency. Results indicated that the tempering and effluent flows were completely mixed by the hydraulic jump in a much shorter length of channel than was required by the standard jet mixing dilution process. (Adams-ISWS)
W75-09757

A SALINE INTRUSION INTO SENECA LAKE, NEW YORK,
Hobart and William Smith Colleges, Geneva, N.Y. Earth and Space Sciences Program.
W. F. Ahrnsbrak.
Limnology and Oceanography, Vol 20, No 2, p 275-278, March 1975. 3 fig, 3 ref.

Descriptors: *Path of pollutants, *Lakes, *New York, *Saline water intrusion, *On-site investigations, Sampling, Evaluation, Water temperature, Freshwater, Water pollution sources, Measurement, Salinity, Saline water, Movement, Conductivity, Water properties, Electrical conductance, Thermocline.
Identifiers: Seneca Lake(NY), Saline plume.

A warm, saline plume sinks, upon entering Seneca Lake, to just above the thermocline, 15 to 25 m deep. At that depth, based on vertical soundings of temperature and conductivity, the plume spreads radially, maintaining a distinct identity for 150-200 m. Temperature measurements alone suggest that the plume retains its identity to a distance of 1 km from its origin. (Humphreys-ISWS)
W75-09765

DEOXYGENATION IN NATURAL STREAMS,
Nebraska Natural Resources Commission, Lincoln. Data Bank.
M. K. Bansal.
Water Resources Bulletin, Vol 11, No 3, p 491-504, June 1975. 3 fig, 1 tab, 27 ref.

Descriptors: *Oxygen requirements, *Natural streams, *Oxygen, *Water quality, *Biochemical oxygen demand, Streams, Inorganic compounds, Oxygen demand, Model studies, Mathematical models, Phosphates, Nitrates, Nutrients, Water pollution, Organic matter, Dissolved oxygen, Water properties, Reaeration, Dispersion, Organic loading, Respiration, Reynolds number, Oxidation.
Identifiers: *Deoxygenation, Carbonaceous matter.

The deoxygenation process in which carbonaceous BOD is biochemically oxidized to reduced inorganic compounds is of great significance in the oxygen demand of stream waters. The BOD decay rate traditionally determined in a laboratory might not necessarily be the same as estimated for a natural stream. The variation in biochemical activity could occur due to differences in adsorption, dispersion, and biophysical processes taking place in the two environments. The first stage biochemical oxygen demand and benthal oxygen demand that occur simultaneously in a stream were considered together to calculate the gross rate of deoxygenation in polluted waters. The available data on deoxygenation measurements were analyzed to calculate the carbonaceous BOD rate constants in natural streams. The analysis indicated that the dimensionless deoxygenation parameter is a function of the ratio of the Reynolds number and Froude number of flow. The functional relationship between these two parameters essentially follows a straight line on a log-log plot. The applicability of the relationship does not depend on the volume of the organic load, size, or location of the stream. (Henley-ISWS)
W75-09767

CATALYTIC OXIDATION OF PHENOL IN AQUEOUS SOLUTION OVER COPPER OXIDE,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-09772

RESERVOIR OPTIMIZATION FOR WATER QUALITY CONTROL,
Pennsylvania Univ., Philadelphia.
For primary bibliographic entry see Field 5G.
W75-09773

SEWAGE DISPOSAL AND WATER SUPPLY ALTERNATIVES ON THE BASIS OF WATER QUALITY AND ECONOMIC CRITERIA,
Michigan Univ., Ann Arbor.
R. Rajagopal.
Available from University Microfilms Inc., Ann Arbor, Michigan, 48106, Order No 74-25302. PhD Thesis, 1974, 178 p.

Descriptors: *Sewage disposal, *Water supply, Costs, *Groundwater, *Michigan, Statistical analysis, Construction costs, Computers, Model studies, Information retrieval, Economics, *Water quality standards, Water pollution sources.

Groundwater quality and economic factors as affected by sewage disposal and water supply alternatives for small rural townships in transition surrounding an urban center were studied. Water quality and cost data obtained from the surrounding townships in the Grand Traverse region of the State of Michigan formed the basis of this analysis. Efforts were divided into three parts: a set of chemical measurements was statistically analyzed and models for nitrate-N in groundwater were developed on the basis of land use, soil and well characteristics; with the help of a sample survey, equations for individual and community sewage disposal and water supply construction costs were formulated; and the above models, along with equations for population growth and distribution, were programmed to form a general interactive computer information system. This information system provides cost of construction of individual and community sewage disposal and water supply facilities and average nitrate-N found in groundwaters for any choice of township, land use and population growth for any future time horizon. (Prague-FIRL)
W75-09774

A STUDY OF THE SURFACE FLUID FLOW CHARACTERISTICS OF THE NEW YORK BIGHT AND THE DEVELOPMENT OF RESEARCH DATA DISPLAY TECHNIQUES,
Earth Satellite Corp., Washington, D.C.
R. T. Macomber, R. L. Mairs, and D. T. Stanczuk.
Final Report, October 15, 1974. 63 p, 25 fig. NOAA Contract No 3-35336.

Descriptors: *Data collections, *Data processing, Satellites(Artificial), *Coasts, *Water pollution, Ocean circulation, Sewage disposal, Littoral drift, Dispersion, Currents(Water), Tides, New York *Remote sensing, Path of pollutants.
Identifiers: *New York Bight, Environmental quality, *Data analysis, Dredge spoil, Marine environment.

The need exists for (1) a demonstration of remote sensing data acquisition applied to studies of the coastal marine ecosystem in the New York Bight area, and (2) a demonstration of the remote sensing based information products which an be provided to area users. An effort has been made to demonstrate the applicability of remote sensor records to the study of circulation, dispersion, and related environmental characteristics, and to develop remote sensor-derived products for potential users in the New York Bight area. It is hoped that this effort will lead to a demonstration of the effectiveness of conversion of remotely revised data and ground truth data into information products which can be used for routine decision making. (NOAA)
W75-09783

PESTICIDES IN FISH FROM A HAWAIIAN CANAL,
Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
For primary bibliographic entry see Field 5A.
W75-09806

AQUATIC INSECT COMMUNITIES OF THE TENRYU RIVER, THEIR COMPOSITION, BIOTIC INDEX AND SEASONAL CHANGE, (IN JAPANESE),
Suzaka High School (Japan).
For primary bibliographic entry see Field 5C.
W75-09807

DIVERSITY OF MARINE INVERTEBRATES IN A THERMAL EFFLUENT,
Delaware Univ., Lewes. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W75-09809

OFFSHORE DEVELOPMENT AND MARINE POLLUTION,
United Nations Secretariat. Office of Legal Affairs.
M. Hardy.
Ocean Development and International Law Journal, Vol 1, No 3, p 239-273, 1973. 73 ref.

Descriptors: *International law, *Oil pollution, *Offshore platforms, *Coastal structures, *Pollution abatement, International waters, Legal aspects, Treaties, Oil industry, Water pollution, Aquatic environment, Engineering structures, Coasts, Drilling, Oceans, Water pollution control, Abatement, Pollutants, Water law, Administration, Legislation, Africa.
Identifiers: Coastal zone management, Hazardous substances(Pollution), International agreements, Territorial waters.

Offshore development, navigation, and fishing are the major economic uses of the sea. The problem of accommodating different interests of the international community in the marine environment in a legal order, with particular focus on marine pollution caused by offshore production of oil, is discussed. The range of techniques, administrative and legal, which are available for coping with the problem of allowing offshore development to proceed, while taking steps to ensure that marine pollution from this source is kept under control, is evaluated. The position under international law and the action taken by international bodies such

as the U.N. Seabed Committee, IMCO, the Stockholm Conference, and OAU are described. Further, national legislation relating to marine pollution caused by offshore mineral development in various countries is surveyed. Generally, the problems must be examined in terms of four issues: the application of adequate information, of adequate supervision, of adequate technical knowledge and equipment, and of suitable sanctions. Although international treaties are matters for future inquiry, the present exigencies require national efforts and co-operation on a regional and sub-regional level. (Fernandez-Florida)
W75-09842

5C. Effects Of Pollution

DISTRIBUTION AND DYNAMICS OF AQUATIC INSECTS IN THE ELK CREEK EXPERIMENTAL WATERSHED, LUBRECHT FOREST, MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 510, $3.25 in paper copy, $2.25 in microfiche. Research Report No 61, Montana University Joint Water Resources Research Center, Bozeman, March 1975. 21 p, 1 fig, 3 tab, 15 ref. OWRT A-050-MONT(1).

Descriptors: *Aquatic insects, Fauna, Environmental effects, Environment, *Ecological distribution, *Montana, Watersheds(Basins), *Regression analysis, *Correlation analysis, Benthos, Streams.
Identifiers: *Stream ecology, *Ecological research, Elk Creek experimental watershed(Mont).

Regression and correlation analysis of insect abundance and environmental factors and of species-species relationships indicates low predictive power for physical factors and much stronger biological correlations. With improved physical measurements, least squares regression analysis should be useful in the estimation of benthos densities in streams. Response surfaces computed from funcational regressions on abundances of co-occurring species indicated quantitative differences in habitat selection by stream insects. (Holje-Montana State)
W75-09528

SILT REMOVAL FROM A LAKE BOTTOM.
Lake Herman Development Association, Inc., Madison, S. Dak.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-660/3-74-017, February 1975. 37 p, 6 fig, 2 tab, 4 ref. 1BA031. 16010 ELF.

Descriptors: *Eutrophication, Water pollution effects, Sediments, Lakes, *Sediment control, *South Dakota, *Dredging, Lake beds, Silts.
Identifiers: *Lake Herman(SoDak), *Silt removal, *Lake bottoms.

Dredging was used as a method to remove 62,600 cubic yards of silt from Lake Herman during the summers of 1970, 1971, and 1972. The silt was transported via a pipeline to a silt deposit area adjacent to the northeast corner of the lake. The water removed by the dredging process drained by gravity along a gradual slope, dropping its silt and losing nutrients to the lush vegetation, and eventually returned to the lake. In the bay area where dredging occurred water depth was increased from 5.5 feet to approximately 11 feet. There was no significant change in the levels of biological organisms or nutrients, except for phosphorus, which increased just after the dredging began. Whether dredging actually caused the increase is still debatable. Vegetation in the deposit area became extremely lush. Water returning to the lake from the deposit area was lower in nutrients than the water in the lake. (EPA)
W75-09575

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: REVIEW AND BIBLIOGRAPHY,
Environmental Impact Center, Inc., Newton, Mass.
S. E. Bascom, K. G. Cooper, M. P. Howell, A. C. Makrides, and F. T. Rabe.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/5-75-002, January, 1975, 276 p. 1HA095 21 ART 11. EQC 317.

Descriptors: *Bibliographies, Publications, Analytical techniques, Community development, Land use, Water resources, Planning, Data collections, Environment, *Investment, Local governments, Waste water treatment, Highways, *Reviews, *Transportation, Regional development, Data storage and retrieval, Environmental effects.
Identifiers: *Environmental impacts.

A review is presented of over fifty major studies and three hundred relevant reports related to secondary environmental impacts on various forms of public investments, e.g. land based transportation and wastewater collection systems. The Bibliography is organized into four sections: Section I is subdivided into: (a) a review of secondary impacts classified according to type of investment (highways, mass transit, and wastewater collection systems); (b) where possible, according to type of secondary effects (economic, social and land use); and (c) a brief summary of modeling techniques which may be utilized to analyse and project likely secondary environmental impacts. Section II condenses the findings of about fifty major studies related to land transportation and wastewater treatment systems. Section IV classifies these literature studies by: (a) impact; (b) investment; (c) geographic area examined; (d) type of study; and (e) type of analytic techniques used in assessing secondary effects. (Scherer-EPA)
W75-09576

HYPOLIMNETIC OXYGENATION USING LIQUID OXYGEN,
Union Carbide Corp., San Francisco, Calif. Aquatic Environmental Sciences.
For primary bibliographic entry see Field 5G.
W75-09589

THE EFFECT OF SULFATE AND MANGANESE DIOXIDE ON THE RELEASE OF PHOSPHORUS FROM LAKE MENDOTA SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
D. M. Olson.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 515, $4.25 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, June 1975. 47 p, 17 fig, 1 tab, 13 ref, 4 append. OWRR A-035-WIS(1), 14-31-0001-3050, 14-31-0001-3250.

Descriptors: *Phosphorus, *Lake sediments, *Eurtophication, *Sulfates, *Manganese oxides, Wisconsin, Lakes, Iron, Water quality standards, Water pollution effects.
Identifiers: Lake Mendota(Wisc).

The recommendation of the National Technical Advisory Committee to the Secretary of the Interior to limit the addition of sulfate or manganese oxide to lakes containing iron in the hypolimnion was evaluated by laboratory experiments in which Lake Mendota sediments were placed in carboys and incubated in the presence of various amounts of sulfate and manganese dioxide. Differences were noted in the quantity of orthophosphate released under anaerobic conditions between carboys that received 1 and 5 mg/l Mn02 and 0 and 10 mg/l MnO2. However, the significance of the observed difference is uncertain in view of the scattered iron data, the level of sulfate maintained, and the oxidizing capacity of the added MnO2. A direct relationship was observed between the quantity of added MnO2 and Mn(II) concentration. The addition of sulfate did not show a direct relationship to the quantity of orthophosphate released under anaerobic conditions. The results of these experiments are concluded to be insufficient to either support or reject the recommendation of the National Technical Advisory Committee.
W75-09619

THE EFFECT OF BASIC CUPROUS CARBONATE ON THE STATE OF THE LIVER IN JUVENILE AMUR AUTUMN CHUM (ONCORHYNCHUS KETA INFRASP. AUTUMNALIS),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Vladivostok (USSR).
A. A. Zhirnova, A. M. Kolgayev, and N. N. Shirokova.
Journal of Ichthyology, Vol 14, No 3, p 453-456, 1974; 2 fig, 15 ref.

Descriptors: *Salmonids, *Chum salmon, *Growth stages, *Juvenile growth stages, *Copper compounds, Cytological studies, Inorganic compounds, Fish physiology, Laboratory tests.
Identifiers: *Oncorhynchus keta, Fingerlings, *Cuprous carbonate, Tissue analysis.

Basic cuprous carbonate had no adverse effects on the development of juvenile Amur Autumn Chum, Oncorhynchus keta. The weights of fingerlings were equivalent for both test and control groups although there was more intensive resorption of the yolk sac in the experimental group. The antiseptic had no significant pathological effects on the liver, nor were differences discovered in copper content in the liver cells. (Katz)
W75-09668

EFFECTS OF SALINE WATER FROM NORTH DAKOTA LAKES ON SURVIVAL OF FATHEAD MINNOW (PIMEPHALES PROMELAS) EMBRYOS AND SAC FRY,
North Dakota State Univ., Fargo. Dept. of Zoology.
B. L. Burnham, and J. J. Peterka.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 809-812, June 1975. 2 tab, 9 ref.

Descriptors: *Minnows, *Saline water, *Growth stages, Salt tolerance, Fish physiology, Toxicity, Embryonic growth stage, Fry, Sodium chloride, Sodium sulfate, Lethal limit, Laboratory tests, Bioassay, On-site investigations, *North Dakota, Lakes, Water pollution effects, Pollutant identification.
Identifiers: *Fathead minnows, *Pimephales promelas, Sac fry, Tissue analysis, Bioaccumulation.

Eggs and sac fry of the fathead minnow (Pimephales promelas) were subjected in the laboratory to various dilutions of water obtained from four saline lakes in North Dakota; three were sodium sulfate-, one a sodium-chloride-type lake. In water from the latter, the percent of fertilized eggs surviving as sac fry for 5 days remained the same as the percent hatched: about 90% at treatment levels of 500-12,000 micromhos, and 68% in undiluted lake water of 18,000 micromhos. In sodium sulfate-type water, however, about 92% of the fertilized eggs hatched at treatment levels of 500 up to only 6,000 micromhos, with about 82% living as sac fry for 5 days in water from two of the lakes and only about 54% living for 5 days in dilutions

made from the most saline lake (lake water of 25,000 micromhos). No sac fry survived for 5 days after hatching in sodium-sulfate-type water of 12,000 micromhos. From laboratory bioassays and field observations, it is estimated that sodium sulfate-type water exceeding 8,000 micromhos during reproductive periods may decrease survival of sac fry. (Katz)
W75-09669

THE EFFECT OF DIFFERENT OXYGEN CONDITIONS DURING INCUBATION ON THE SURVIVAL AND SOME OF THE DEVELOPMENTAL CHARACTERISTICS OF THE 'VERKHOVA' (LEUCASPIUS DELINEATUS) IN THE EMBRYONIC PERIOD,
Akademiya Nauk SSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
M. V. Gulidov.
Journal of Ichthyology, Vol 14, No 3, p 393-397, 1974. 4 tab, 2 ref.

Descriptors: Freshwater fish, Growth stages, *Growth rates, *Fish eggs, *Embryonic growth stage, *Oxygen requirements, *Toxicity, *Dissolved oxygen, *Fish physiology, Laboratory tests, Life cycles, Lethal limit, Respiration.
Identifiers: *Leucaspius delineatus, *Cyprinids, Oxygen concentrations, Developmental stages, Blastoderm.

Four series of experiments were carried out on the incubation of the eggs of Leucaspius delineatus from the stages of commencement of over-growth of the yolk sac by the blastoderm-closure of the yolk plug to the hatching of embryos at different oxygen concentrations. The data obtained are examined in the light of the ecological developmental characteristics of L. delineatus under natural conditions. (Katz)
W75-09670

SELENIUM TOXICITY ON THE EARLY LIFE STAGES OF ZEBRAFISH (BRACHYDANIO RERIO),
Ottawa Univ (Ontario). Dept. of Biology.
A. J. Niimi, and Q. N. Laham.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 803-806, June 1975; 2 tab, 18 ref.

Descriptors: Fish, *Growth stages, *Embryonic growth stage, *Larvae, *Inorganic compounds, Groundwater, Surface water, Environmental effects, Fish eggs, Animal physiology, Aquaria, Lethal limit, *Toxicity, Mortality, Laboratory tests, Water pollution effects.
Identifiers: *Selenium, *Zebrafish, Brachdanio rerio, Fish embryology.

Embryos at four stages of development and newly hatched larvae of zebrafish (Brachydanio rerio) were exposed to selenium concentrations between 0.5 and 10 micrograms per milliliter to establish toxic levels. Embryo mortality was negligible at all selenium concentrations. Following hatching, mortality among the larvae sharply increased at concentrations of 3 micrograms per milliliter or greater irrespective of the embryonic stage when exposed. For most treatments, over 90% of the larvae died within 10 days of hatching. The mortality rate for larvae exposed to selenium after hatching was slightly less. (Katz)
W75-09671

EFFECTS OF KOKANEE SALMON (ONCORHYNCHUS NERKA) DECOMPOSITION ON THE ECOLOGY OF A SUBALPINE STREAM,
California Univ., Davis. Div. of Environmental Studies.
S. E. Richey, M. A. Perkins, and C. R. Goldman.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 817-820, June 1975, 2 fig, 14 ref.

Descriptors: *Salmonids, *Cycling nutrients, *Decomposing organic matter, *Primary productivity, *Food chains, *Food wegx, *Biomass, *Spawning, *Phosphorus, Streamflow, Ecosystems, Life cycles, Sampling, Plankton, Downstream, Upstream, Water pollution effects.
Identifiers: *Kokanee salmon, Oncorhynchus nerka, *Salmon carcasses, Autotrophs, Heterotrophs.

The role of kokanee salmon (Oncorhynchus nerka) carcass decomposition in the nutrient cycles and energy flow of a subalpine stream was investigated during a season (1970-1971) of high spawner abundance and a season (1972-1973) of low spawner abundance with a December storm flushing the stream of carcasses. Primary production, periphyton biomass, heterotrophic activity, and nutrient concentrations were greater downstream than upstream during the peak carcass decomposition of 1971, whereas they were the same at other times of that year and in 1972-73. Calculations showed that upstream-downstream differences in phosphate could be accounted for by the salmon carcasses. (Katz)
W75-09672

THE BOTTOM FAUNA OF CHINA CLAY WASTE DEPOSITS IN MEVAGISSEY BAY,
Otago Univ., Portobello (New Zealand). Marine Biological Station.
P. K. Probert.
Journal of the Marine Biological Association of the United Kingdom, Vol 55, p 19-44, 1975. 10 fig, 4 tab, 67 ref.

Descriptors: *Sediments, *Mine wastes, *Industrial wastes, *Benthic fauna, Water pollution effects, Environmental effects, Benthos, Silts, Clays, Sampling, Distribution, Mollusks, Worms, Biological communities, Water pollution control.
Identifiers: *China Clay waste, Polychaetes, Echinoderms, *New Zealand, Mevagissey Bay(NZ).

A survey of the infaunal macrobenthos of fine-grained china clay waste deposits in Mevagissey Bay, Cornwall, was carried out before the cessation of these discharges. The results are compared with earlier studies in the bay and the grosss structure and extent of the bottom fauna associations are described, from which it is hoped that major post-pollution changes may be followed. The observed faunal impoverishment in the nearshore regions of the bay is attributed to sediment instability resulting from high rates of deposition combined with certain physical properties of the sediment preventing the establishment of those species, especially tubicolous polychaetes, which tend to bind the sediment and make it more suitable for colonization by other benthic organisms. (Katz)
W75-09673

EFFECT OF DDT ON DISCRIMINATING ABILITY OF RAINBOW TROUT (SALMO GAIRDNERI),
Alberta Univ., Edmonton. Dept. of Zoology.
P. C. McNicholl, and W. C. MacKay.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 785-788, June 1975.

Descriptors: *Organoleptic properties, *DDT, *Light intensity, *Chlorinated hydrocarbon pesticides, *Salmonids, *Rainbow trout, Lethal limit, Fish physiology, Water pollution effects.
Identifiers: *LD50, *Visual discrimination, Linear equations.

Rainbow trout, Salmo gairdneri, trained to discriminate between a bright (723 lx) and a dim (22 lx) light were tested to determine the minimum difference in light intensity they could distinguish before and 71 h after being fed DDT orally at 0,30,50 and 80% of the LD50 dose. Discriminating ability decreased linearly with increased dose, while performance and retention remained unaffected. (Katz)
W75-09674

A COMPARATIVE STUDY OF THE TOLERANCE OF TWO FRESHWATER PLANARIANS, DUGESIA TIGRINA AND POLYCELIS FELINA, TO LOW OXYGEN LEVELS, (ETUDE COMPARATIVE DE LA TOLERANCE AUX BASSES TENSIONS D'OXYGENE CHEZ DEUX PLANAIRES D'EAU DOUCE, DUGESIA TIGRINA ET POLYCELIS FELINA),
Lyon-1 Univ., Villeurbanne (France). Departement de Biologie et Zoologie.
R. Russier-Deloime.
Annales de Limnologie, Vol 10, No 3, p 311-322, 1974. 1 fig, 3 tab, 15 ref. English abstract.

Descriptors: *Aquatic animals, *Dissolved oxygen, *Resistance, *Oxygen demand, Water properties, Turbidity, Adaption, Speciation, Environmental effects, Water pollution effects.
Identifiers: *Planarians, *Dugesia tigrina, *Polycelis felina, Comparative studies.

A closed-bottle method was used for determining the lethal level of oxygen for two fresh-water Triclads, Dugesia tigrina, and Polycelis felina, in stagnant as well as in stirred water. The lethal level was about 0.30 mg if dissolved oxygen per liter. However it varies significantly according to the species and to whether the water is stirred or not. At low oxygen concentrations, both species reduce considerably their metabolism, i.e. they adapt to the low oxygen levels. D. tigrina does so to a greater extent than P. felina. D. tigrina also survives 6 times longer than P. felina in such unfavorable conditions. (Katz)
W75-09675

AVOIDANCE OF FENITROTHION BY GOLDFISH (CARASSIUS AURATUS),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
E. Scherer.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 492-496, April 1975. 1 fig, 1 tab, 6 ref.

Descriptors: *Fish behavior, *Pesticides, *Bioassay, Laboratory tests, Toxicants, Environmental effects, Water pollution effects, Toxicity, *Lethal limit, Pollutant identification.
Identifiers: *Sublethal effects, Carassius auratus, *Fenitrothion, *Avoidance(Fish), *Goldfish.

Goldfish (Carassius auratus) avoided water containing the pesticide fenitrothion. The response was graded over the tested concentration range of five orders of magnitude. The threshold was around 10 micro-grams per liter to 3.5 X 10-8M, which was well below the incipient lethal level. (Katz)
W75-09677

THE EFFECTS OF OILS ON GROWTH OF FRESHWATER PHYTOPLANKTON,
Polytechnic of Central London (England). Dept. of Life Sciences.
V. N. Dennington, J. J. George, and C. H. E. Wyborn.
Environmental Pollution, Vol 8, No 3, p 233-237, April 1975. 2 fig, 2 tab, 13 ref.

Descriptors: *Phytoplankton, *Euglena, *Scenedesmus, *Primary productivity, *Growth rates, *Oil pollution, Populations, Sampling, Photosynthesis, Food chains, Water pollution effects, Cultures, Metabolism.
Identifiers: Freshwater phytoplankton, *Euglena gracilis, *Scenedesmus quadricauda, Diesel oils, Lubricating oils.

Experiments investigating the effects of oils on pure cultures of freshwater algae show that Euglena gracilis grew in cultures containing up to 10% diesel and lubricating oils. The growth of Scenedesmus quadricauda was reduced by lubricating oil and halted by the presence of diesel oil. It was suggested that oils may affect photosynthetic metabolism in sensitive species. (Katz)
W75-09678

MERCURY IN SEALS, TERRESTIAL CARNIVORES AND PRINCIPAL FOOD ITEMS OF THE INUIT, FROM HOLMAN, N.W.T.,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5A.
W75-09679

EFFECTS OF PCB ON INTERSPECIFIC COMPETITION IN NATURAL AND GNOTOBIOTIC PHYTOPLANKTON COMMUNITIES IN CONTINUOUS AND BATCH CULTURES,
State Univ. of New York, Stony Brook. Marine Biology Program.
N. S. Fischer, E. J. Carpenter, C. C. Remsen, and C. F. Wurster.
Microbial Ecology, Vol 1, No 1, p 39-50, 1974. 4 fig, 2 tab, 43 ref.

Descriptors: *Polychlorinated biphenyls, *Diatoms, Competition, *Algae, *Phytoplankton, Methodology, *Analytical techniques, Pesticides, Chlorinated hydrocarbon pesticides, Laboratory tests, Environmental effects, Primary productivity, Water pollution effects.
Identifiers: *Thalassiosira pseudonana, *Gnotobiotic communities.

The toxicity of PCBs to the diatom Thalassiosira pesudonana grown in pure and mixed cultures was greatest when in competition with other species. Continuous cultures were superior to batch cultures for studying competitive interaction, and PCB caused greater alteration of species composition in continuous cultures than in batch cultures. Normal phytoplankton communities, maintained in continuous culture, responded to PCB stress the same as did gnotobiotic communities, with T. pseudonana showing similar responses in both communities. A PCB concentration of 0.1 microgram g/l did not affect algal growth in pure cultures but caused substantial disruption of continuous culture communities. The possible impact of PCB pollution on natural phytoplankton communities is discussed. (Katz)
W75-09680

EFFECT OF TEMPERATURE ON ACCUMULATION OF METHYLMERCURIC CHLORIDE AND P,P' DDT BY RAINBOW TROUT (SALMO GAIRDNERI),
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
R. E. Reinert, L. J. Stone, and W. A. Willford.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1649-1652, October, 1974. 1 fig, 1 tab, 10 ref.

Descriptors: Temperature, *Heated water, *Rainbow trout, *Pesticide residues, *DDT, *Mercury, Laboratory tests, Bioassay, Analytical techniques, Methodology, Gas chromatography, DDE, Metabolism, Environmental effects, Water pollution effects, Thermal pollution, Water temperature.
Identifiers: Bioaccumulation, *Methylmercuric chloride.

Amounts of mercury and DDT residues accumulated from water by yearling rainbow trout in the laboratory increased as water temperature increased. Fish exposed to methylmercuric chloride at concentrations of 234-263 parts per trillion for 12 weeks at 5,10 and 15C accumulated 1.19, 1.71 and 1.96 ppm; fish exposed to DDT at concentrations of 133-176 parts per trillion accumulated 3.76, 5.93 and 6.82 ppm. Concentrations of mercury accumulated by the fish were significantly different at each of the three temperatures, and the concentrations of DDT were significantly different at 5, 10 and 15C. (Katz)
W75-09681

POND SNAIL EGGS AS AN INDICATORY MATERIAL FOR WATER POLLUTION BIOASSAY: PRELIMINARY EXPERIMENTS, (IN JAPANESE),
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
The Japanese Journal of Limnology, Vol 35, No 4, p 155-161, October 1974. 2 fig, 4 tab, 11 ref. English abstract.

Descriptors: *Monitoring, *Bioassay, *Bioindicators, Water quality control, *Snails, *Inhibition water pollution effects, Pollutant identification, Water quality, Laboratory tests, Growth rates mercury, Cadmium, Copper, Zinc, Chromium, Lead, Metals, Polychlorinated biphenyls, *Pollutant identification.
Identifiers: *Radix auricularius japonicus, Japan(Osaka).

Bioassays were made to measure the water pollution around Osaka city using pond snail (Radix auricularius japonicus) eggs as an indicator organism. No cleavage of eggs occurred in the heavily polluted sewage disposal plant discharge. Heavy metals stop, retard or deform development, as do some other chemicals. The advantages of using pond snail eggs as a bioassay organism are simplicity, speed, high sensitivity, uniformity and accuracy. (Katz)
W75-09682

USE OF SODIUM PENTACHLOROPHENATE AND DEHYDROABIETIC ACID AS REFERENCE TOXICANTS FOR SALMONID BIOASSAYS,
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis, and R. A. W. Hoos.
Journal of the Fisheries Research Board of Canada, Vol 32, No 3, p 411-416, March 1975. 2 tab, 12 ref.

Descriptors: Toxicity, *Salmonids, *Bioassay, Standards, Laboratory tests, Rainbow trout, Trout, Salmon, *Toxicants, Lethal limit, Water temperature, Hardness(Water), Hydrogen ion concentration, Testing, Laboratory tests, Sockeye salmon, Pollutant identification.
Identifiers: *Sodium pentachlorophenate, Reference toxicants, *Dehydroabietic acid, Coho salmon, *Toxicity tests, Oncorhynchus ssp.

Results of an interlaboratory bioassay standardization exercise involving seven independent fish bioassay laboratories in British Columbia are presented. Toxicity of standard solutions of sodium pentachlorophenate and dehydroabietic acid was determined in freshwater static bioassays with yearling rainbow trout (Salmo gairdneri), coho salmon (Oncorhynchus kisutch) and sockeye (Oncorhynchus nerka) salmon. Reported LC50's for the three species ranged from 37 to 130 ppb for sodium pentachlorophenate and 1.03-2.14 ppm for dehydroabietic acid. In general, test results for individual species and toxicants were fairly consistent and major disparities could be explained in some instances by variations in physical and chemical characteristics of the bioassay such as water temperature, hardness or pH. Fish size and condition factor appeared to have little effect on apparent toxicity over the ranges tested. The usefulness of reference toxicants for standardizing bioassays is emphasized and suggestions are made for improved test procedures and increasing accuracy of results. Guidelines for toxicity tests should include the use of reference toxicants as a means of standardizing bioassay results. (Katz)
W75-09683

EFFECT OF POWER PLANT CHLORINATION ON ESTUARINE PRODUCTIVITY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. L. Fox, and M. S. Moyer.
Chesapeake Science, Vol 16, No 1, p 66-68, March 1975. 2 fig, 22 ref.

Descriptors: *Chlorination, *Water purification, *Cooling water, *Powerplants, Water treatment, Control, Primary productivity, Chlorine, *Water pollution effects, *Florida.
Identifiers: *Biological fouling, Crystal River powerplant(Fla).

Power plants chlorinate their cooling waters to prevent biological fouling of condenser tube walls. The effects of chlorine on in situ net primary productivity in the discharge waters of a power plant at Crystal River, Florida were examined. Primary productivity values decreased an average of 57% due to plant passage and chlorination. in the absence of chlorine, the average decrease was 13%. (Katz)
W75-09684

EFFECTS OF LOGGING ON WATER TEMPERATURE AND DISSOLVED OXYGEN IN SPAWNING BEDS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
N. H. Ringler, and J. D. Hall.
Transactions of the American Fisheries Society, Vol 104, No 1, p 111-121, 1975. 8 fig, 5 tab, 28 ref.

Descriptors: *Fish reproduction, *Water temperature, *Dissolved oxygen, *Spawning, *Lumbering, Streams, *Salmonids, Environmental effects, Salmon, Trout, Ecosystems, Sediments, Commercial fishing, Water quality, Temperature, Life cycles, Fry, Mortality, *Clearcutting, Water pollution effects.
Identifiers: *Coho salmon, Cutthroat trout, Intragravel water, Survival.

The temperature and dissolved oxygen content of intragravel water were measured in three Oregon coastal streams between June 1968 and June 1969. In 1966, the watershed of one stream had been completely clear-cut, and that of a second stream partially clearcut in staggered settings. A third watershed was left unlogged. Clearcut logging resulted in increased temperature of intragravel water in salmon and trout spawning beds and decreased concentrations of dissolved oxygen. The changes were related largely to reduced forest cover over the stream surface and to deposition of fine sediments in the gravel. No serious reduction in survival to emergence of coho salmon occurred along with the observed changes in temperature or dissolved oxygen. A decrease in the resident population of cutthroat trout after logging may have been related to these changes. (Katz)
W75-09685

DDT AND THE RUGOPHILIC RESPONSE OF SETTLING BARNACLES BALANUS IMPROVISUS,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
N. Meith-Avcin.
Journal of the Fisheries Research Board of Canada, Vol 31, No 12, p 1960-1963, December 1974, 4 fig, 1 tab, 5 ref.

Descriptors: *Crustaceans, *Organic pesticides, *DDT, Laboratory studies, Fish physiology, Water pollution effects.
Identifiers: Balanus improvisus, *Rugophilic response, *Barnacles, *Cyprids, Tactile discrimination, Glass settling plates.

Treatment of glass-settling plates with DDT generally resulted in lowered settlement densities of the cyprids of Balanus improvisus and lowered indices of preference for roughened surfaces, indicating that DDT interferes with the cyprids' rugophilic response pattern, particularly tactile discrimination, to settlement surfaces. (Katz)
W75-09686

ACUTE TOXICITY OF NITRITE TO RAINBOW TROUT (SALMO GAIRDNERI),
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. C. Russo, C. E. Smith, and R. V. Thurston.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1653-1655, October 1974. 1 fig, 1 tab, 10 ref.

Descriptors: *Trout, *Salmonids, *Bioassay, *Lethal limit, *Nitrites, *Toxicity, Water pollution sources, Sewage, Nitrification, Laboratory, studies, Fish physiology, Water pollution effects.
Identifiers: Bioaccumulation, *Methemoglobinemia, Tissue analysis.

Flow-through bioassays on the acute toxicity of nitrite to rainbow trout (Salmo gairdneri) of four different sizes (2-235g) showed median lethal concentration (LC50) values for 4 days ranging from 0.19 to 0.39 mg/liter NO2-N. For 12-g rainbow trout the asymptotic LC50 was 0.14-0.15 mg/liter NO2 after 8 days. Resulting methemoglobinemia due to the exposure of salmonids to nitrite was discussed. (Katz)
W75-09687

THE EFFECTS OF LAPSED TIME SINCE FEEDING UPON THE TOXICITY OF ZINC TO FISH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., W. H. van der Schalie, and G. F. Westlake.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 3, p 269-274, March 1975. 1 fig, 2 tab, 5 ref.

Descriptors: *Bioassay, Methodology, *Laboratory tests, *Toxicity, *Zinc, *Time, *Toxicants, Mortality, Pollutants, Analytical techniques, Fish, Standards, Water pollution effects.
Identifiers: *Carassius auratus, Fishfeeding.

Fish bioassays advise a period of no feeding before exposing the fish to potential toxicants. The validity of this procedure was tested by determining the effects of different lapsed times between feeding and placement in a toxicant. Fish were placed in water containing a lethal concentration of zinc at specific times after feeding from 0-72 hours. Time until death was recorded for each fish. Statistical analysis revealed a slight increase in survival time as the interval between feeding and exposure to zinc increased. This did not appear to be of sufficient magnitude to support the standard acute bioassay requirement that fish not be fed for 24-48 hours prior to their exposure to a toxicant. (Katz)
W75-09688

DDT RESIDUES IN EUPHAUSIIDS IN THE UPPER ESTUARY OF THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia).
D. C. Darrow, S. Guildford, and D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol 32, No 2, p 310-314, February 1975.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Zooplankton, Aquatic populations, *Food chains, *Primary productivity, Analytical techniques, Equations, Lipids, *Pesticide residues.
Identifiers: *Euphausiids, Thysanoessa raschii, Thysanoessa inermis, Meganyctiphanes norvegia, *Gulf of St. Lawrence.

No significant variation was found in organochlorine residue levels between different stations in an area from the Saguenay River to the end of the Gaspe' Peninsula in the Gulf of St. Lawrence for the euphausiids Thysanoessa raschii, T. inermis and Meganyctiphanes norvegica. Significant differences were found between the concentration of organochlorine residues for M. norvegica and the Thysanoessa species, but there was no difference between the two Thysanoessa species. Significantly lower values for percent lipid were found in T. inermis and T. raschii between June 1973 and May 1974 samples, but the total amount of organochlorine residues did not change. This suggests that these species do not lose p,p'-DDT when they metabolize lipids for energy or the production of gonad material. (Katz)
W75-09690

UPTAKE, METABOLISM AND DISTRIBUTION OF DDT IN ORGANS OF THE BLUE CRAB, CALLINECTES SAPIDUS,
Virginia Inst. of Marine Science, Gloucester Point.
P. F. Sheridan.
Chesapeake Science, Vol 16, No 1, p 20-26, March 1975. 3 tab, 41 ref.

Descriptors: *DDT, DDE, DDD, *Pesticide residues, *Bioassay, *Crabs, Commercial shellfish, *Chlorinated hydrocarbon pesticides, *Metabolism, *Virginia, *Absorption, Distribution, Water pollution effects.
Identifiers: Tissue analysis, Hepatopancreas, Gonads, *Bioaccumulation, Callinectes sapidus, *York River(Virginia).

Metabolites of DDT were detected in five out of six major organs of adult blue crabs collected from the York River, Virginia during the summer of 1972. Total residue concentrations were highest in the hepatopancreas (55-217 ppb) and below the limit of detection in the heart and associated serum. Concentrations in pooled gonad samples (ovaries and testes) were variable (9-67 ppb) and correlated with the development stage of the ovaries. Residue levels were low in the gills (6-31 ppb), backfin muscles and edible claw (1-13 ppb). DDT itself was not detected in any of the organs. Adult blue crabs were exposed for 12 hours to 0.01, 0.1 and 1.0 ppm DDT in water and monitored with respect to metabolism and distribution of residues. Metabolic transformation of DDT to DDD and DDE occurred immediately, regulated by the hepatopancreas. (Katz)
W75-09691

DEPOSITION OF ZINC AND CADMIUM BY MARINE BACTERIA IN ESTUARINE SEDIMENTS,
Geological Survey, Corpus Christi, Tex.
C. W. Holmes, and C. J. McLerran.
Limnology and Oceanography, Vol 19, No 3, p 998-1001, 1974. 2 fig, 8 ref.

Descriptors: *Texas, Bacteria, *Aquatic bacteria, *Estuaries, *Heavy metals, Translocation, *Zinc, *Cadmium, *Sediments, *Radioactive isotopes, Growth cycles, Populations, Cultures, Metabolism, Growth rates, Environmental effects, Laboratory tests, Water pollution effects.
Identifiers: Bioaccumulation, Corpus Christi Harbor(Tex).

Mixed cultures of marine bacteria isolated from the sediments of Corpus Christi Harbor, Texas, were examined for their ability to assimilate or precipitate radioactive zinc and cadmium from solution. Test data indicate that during summer, when bacterial activity is at a maximum, the bacteria and their metabolic byproducts play a significant role in the removal of zinc and cadmium from seawater and their subsequent deposition in marine sediments. (Katz)
W75-09692

EFFECT OF ZINC ON GROWTH OF THE MINNOW PHOXINUS PHOXINUS,
Umea Univ. (Sweden). Dept. of Biology.
B. E. Bengtsson.
Oikos, Vol 25, No 1, p 370-373, 1974. 2 fig, 2 tab, 15 ref.

Descriptors: Freshwater fish, *Bioassays, *Growth rates, *Growth stages, *Fish physiology, *Nitrates, Environmental effects, Biochemistry, Laboratory studies, Water pollution effects, Metabolism, Pesticides, *Zinc.
Identifiers: *Phoxinus phoxinus, *Minnows, *Zinc nitrate, Bioaccumulation, Tubifex, Comparative studies, Sublethal dosages.

Reduced growth occurred in yearlings and adults of the minnow Phoxinus phoxinus following exposure to zinc nitrate in fresh water over a 150-day period. Yearlings were more sensitive than adults and showed reduced growth at 0.13 ppm zinc (corresponding to 1/25 of the 96-hr. LC50). Supressed growth was associated with reduced Tubifex consumption. Both yearlings and adults showed a pronounced initial response. (Katz)
W75-09693

CHANGES IN BLOOD CHEMISTRY OF JUVENILE STEELHEAD TROUT, SALMO GAIRDNERI, FOLLOWING SUBLETHAL EXPOSURE TO NITROGEN SUPERSATURATION,
National Marine Fisheries Service, Seattle, Wash.
T. W. Newcomb.
Journal of the Fisheries Research Board of Canada, Vol 31, No 12, p 1953-1957, December 1974. 1 fig, 28 ref.

Descriptors: *Salmonids, *Trout, *Nitrogen, *Argon, *Tissue analysis, *Fish physiology, *Chemical analysis, Environmental effects, Laboratory tests, Dissolved oxygen, Stress, Water pollution effects.
Identifiers: *Blood chemistry, *Swimming performance, Sublethal saturation, Gas embolism.

Groups of juvenile steelhead trout (Salmo gairdneri) were exposed for 35 days to various (103, 105, 110 and 116%) sublethal nitrogen plus argon saturations. Pooled serum samples were analyzed for Ca, Na, PO4, K, Cl, albumin, total protein, cholesterol, alkaline phosphatase, glucose, urea, uric acid, total biblirubin, lactate dehydrogenase, and serum glutamic oxalacetic transaminase. An increase in serum potassium and phosphate, and a decline in serum albumin, calcium, cholesterol, total protein and alkaline phosphatase were noted in steelhead exposed to 116% nitrogen (N2+Ar) saturation (total atmospheric gas saturation 110%). No major changes in blood chemistry were observed at nitrogen saturations of 110% or less. (Katz)
W75-09694

THE EFFECT OF CONCENTRATION OF SUSPENSION AND INERT MATERIAL ON THE ASSIMILATION OF ALGAE BY THREE BIVALVES,
Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
R. L. Foster-Smith.
Journal of the Marine Biological Association of the United Kingdom, Vol 55, p 411-418, 1975. 4 fig, 4 tab, 7 ref.

Descriptors: *Suspended solids, *Crustaceans, *Selectivity, *Filtration, Suspension, Mussel, Laboratory tests, Algae, Feeding rates, Analytical techniques, Water pollution effects.
Identifiers: Mytilus edulis, Cerastoderma edule, Venerupis pullastra, Pallial organs, Assimilation efficiency, Gills.

The effect of concentration of food in suspension on assimilation efficiences was investigated using Mytilus edulis, Cerastoderma edule, and Venerupis pullastra. Assimilation efficiency was inversely related to the total amounts of Phaeodactylum ingested over periods of up to 3 h rather than related directly to concentration of suspension or rates of ingestion. The pallial organs did not select Phaeodactylum in preference to inorganic particles (alumina), but once ingested the alumina had little effect on the proportion of Phaeodactylum ingested. (Katz)
W75-09695

THE ACCUMULATION OF FLUORIDE BY MARINE AND INTERTIDAL ANIMALS,
Newcastle-upon-Tyne Univ. (England). Dept. of Plant Biology.
D. A. Wright, and A. W. Davison.
Environmental Pollution, Vol 8, No 1, p 1-13, January 1975. 1 fig, 9 tab, 22 ref.

Descriptors: *Toxicity, *Aluminum, *Industrial wastes, Invertebrates, *Bioassay, *Marine animals, Intertidal areas, Mollusks, Mussels, Baseline studies, Public health, Estuaries, Fluorides.
Identifiers: *Bioaccumulation, *Mytilus edulis.

Preliminary toxicity tests with fluoride were carried out on a number of marine invertebrates. Evan at unnaturally high ambient fluoride levels, no adverse effects were seen, except possibly in the case of the filter-feeding mollusc Mytilus edulis. In both invertebrates and vertebrates, fluoride was accumulated in skeletal structures. There was little or no accumulation in soft, edible tissues, with the exception of fish skin. (Katz)
W75-09697

EFFECTS OF THIOUREA TREATMENT ON SEXUALLY MATURING AND GONADECTOMIZED MALE SOCKEYE SALMON (ONCORHYNCHUS NERKA),
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
J. R. McBride, and A. P. Overbeeke.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 11-19, January 1975. 4 fig, 1 tab, 26 ref.

Descriptors: *Sockeye salmon, *Growth stages, *Gonads, *Bioassay, *Fish physiology, Biochemistry, Sexual maturity, Salmonids, Laboratory tests, Water pollution effects.
Identifiers: *Thyroid, *Pituitary gland, Cell types, *Tissue analysis, Gonadectomized fish, *Thiourea, Thyrotrops, Negative feedback, PAS-positive cells, Mycoid cells.

Adult male sockeye salmon (Oncorhynchus nerka) in the final stage of sexual maturation were treated with thiourea for periods of 7-14 weeks which produced strong histological thyroid stimulation but no visible effect on spermatogenesis or development of secondary sexual characteristics. Thiourea inhibited the increase in thickness of the skin and induced changes in the pars distalis of the pituitary gland, involving several cell types, including retardation of gonadotrop development. In gonadectomized fish, thiourea affected neither the skin nor the interrenal tissue. It caused a marked increase in the height of the thyroid epithelium correlated with hypertrophy, degranulation, and some vacuolization of PAS-positive cells in the dorso-caudal area of the proximal pars distalis of the pituitary gland. (Katz)
W75-09699

BEHAVIOR OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO SUMITHION (FENITROTHION), AN ORGANOPHOSPHATE INSECTICIDE,
British Columbia Dept. of Recreation and Conservation, Victoria. Fish and Wildlife Branch.
C. J. Bull, and J. E. McInerney.
Journal of the Fisheries Research Board of Canada, Vol 31, No 12, p 1867-1872, December 1974. 2 fig, 22 ref.

Descriptors: *Salmon, *Organophosphorus pesticides, *Insecticides, *Fish behavior, *Bioassay, *Fish physiology, *Salmonids, *Water pollution effects, Laboratory tests, Environmental effects.
Identifiers: Oncorhynchus kisutch, *Coho salmon, *Sumithion, Locomotion, Comfort behavior.

Coho salmon, Oncorhynchus kisutch, were exposed to sublethal concentrations of the organophosphate pesticide Sumithion. After 2-hr exposure at 0.48 and 0.75 ppm, behavior involving locomotion ceased, except coughing which increased. In the 0-0.23 ppm range social behavior and feeding decreased. Feeding was depressed at concentrations as low as 0.1 ppm. (Katz)
W75-09700

EFFECT OF CONSTANT TEMPERATURE ON GROWTH RATES OF PUMPKINSEED SUNFISH (LEPOMIS GIBBOSUS),
Queen's Univ., Kingston (Ontario). Dept. of Zoology.
E. Pessah, and P. M. Powles.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1678-1682, October 1974. 4 fig, 1 tab, 13 ref.

Descriptors: *Sunfishes, *Growth rates, *Water temperature, Bioassay, Thermal pollution, Aquiculture, Laboratory studies, Environmental effects, Growth stages, Fish physiology, Metabolism, Thermal pollution, Water pollution effects.
Identifiers: *Pumpkinseed sunfish, Lepomis gibbosus, *Growth acclimation, Growth model.

Relative growth rates of fall-captured Lepomis gibbosus exposed to six constant temperature regimes (5-30C) were clearly separable for the first six weeks. Thereafter, growth declined, becoming uniform between 15 and 30C, and linear and negative at 10 and 5C, respectively. A growth model between 15 and 30C, emerged as follows: 0-4 wk, rapid; 5-10 wk, intermediate; 11-16 wk, low uniform. The initial high followed by the low uniform stanza suggests 'growth acclimation' took place. (Katz)
W75-09701

ORGANOCHLORINE RESIDUE LEVELS IN ARCTIC RINGED SEALS: VARIATION WITH AGE AND SEX,
Bedford Inst., Dartmouth (Nova Scotia).
R. F. Addison, and T. G. Smith.
Oikos, Vol 25, No 3, p 335-377, 1974. 2 tab, 8 ref.

Descriptors: *Pesticide residues, *DDT, *Lipids, *DDE, *Polychlorinated biphenyls, Chlorinated hydrocarbon pesticides, Pesticides, Aging(Biological), Path of pollutants, Mammals, Age, Water pollutant effects.
Identifiers: *Arctic ringed seals, Tissue analysis, Bioaccumulation, Sex.

Residues of DDT, DDE and PCB's were found in blubber samples of Canadian Arctic ringed seals Pusa hispida at concentrations in the low ppm range. In males, residue concentration increased with age, slopes of the curves relating DDE and DDT to age differed significantly ($P<0.01$) from zero, but the relationship between PCB and age was weaker ($P<0.05$). In females, these relationships were absent. (Katz)
W75-09702

EFFECTS OF METAL-MINE DRAINAGE ON WATER QUALITY IN SELECTED AREAS OF COLORADO, 1972-73,
Geological Survey, Denver, Colo.
R. E. Moran, and D. A. Wentz.
Colorado Water Resources Circular No 25, 1974. 250 p, 31 fig, 22 tab, 55 ref, append. Published by Colorado Water Conservation Board, Denver.

Descriptors: *Path of pollutants, *Water pollution sources, *Mine drainage, *Mine wastes, *Colorado, Acid mine water, Mine water, Mining, Spoil banks, Waste dumps, Water pollution effects, Water quality, Water chemistry.

In 18 mining areas in Colorado, significant amounts of acidity and metals are added to surface waters by drainage from mines and associated tailings. In the vicinity of Kerber Creek, acid drainage from an abandoned adit flows through a tailings pile and then into the stream; metal contributions from the tailings are greater than those from the adit. Stream pH's increase below the drainage due to dilution and neutralization of the acid by bicarbonate. Dissolved metal concentrations decrease due to dilution, chemical precipitation, and probably adsorption onto ferric hydroxide particles. Total metal concentrations in streams of the Kerber Creek area decrease downstream due to dilution and to settling of the precipitates. Manganese and zinc remain predominantly in the dissolved phase: when they do precipitate they settle out rapidly. Cadmium, copper, iron, lead, and nickel gradually shift from the dissolved to the suspended fraction, indicating a different removal process. Both total and dissolved metal loads in streams of the Kerber Creek area are greater during high flow than during low flow, owing to flushing of water from mines and tailings piles, erosion of tailings, and scouring of chemical precipitates from the stream bottom. (Knapp-USGS)
W75-09712

EVALUATION OF ENVIRONMENTAL IMPACT OF LANDFILLS,
Wisconsin Univ., Madison.
P. Caffrey, M. David, and R. K. Ham.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE1, Paper 11119, p 55-69, February 1975. 1 fig, 4 tab, 1 append. NSF Grant GI-29731.

Descriptors: *Landfills, *On-site investigations, *Waste dumps, *Wisconsin, Land management, Waste disposal, Evaluation, Environmental effects, Water quality, Aesthetics, Environmental engineering, Inspection, Water pollution effects.
Identifiers: *Environmental impact, Noise, Vectors, Air quality.

In order to evaluate various refuse recycling and disposal alternatives, it was necessary to evaluate the environmental impact of present disposal methods (landfill). The method used involves evaluating ratings for 20 field factors to determine the effect on six basic environmental parameters. This procedure was used to evaluate 69 sites in Wisconsin. The results showed that land use and esthetics were affected most by landfills, followed by air and water quality with lesser effects on noise and vectors. Further analysis compared average ratings for various types of land disposal sites and showed that city and county sites had less environmental impact than town or village sites and that sanitary sites performed better than open dumps. (Lardner-ISWS)
W75-09761

PICK UP AND METABOLISM OF DDT, DIELDRIN AND PHOTODIELDRIN BY A FRESHWATER ALGA (ANKISTRODESMUS AMALLOIDES) AND A MICROCRUSTACEAN (DAPHNTA PULEX),
Illinois Univ., Chicago. Dept. of Biological Sciences.
S. Neudorf, and M. A. Q. Khan.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 4, p 443-450, April 1975. 2 fig, 3 tab, 27 ref.

Descriptors: *DDT, *DDD, *Pesticides, *Absorption, Adsorption, *Metabolism, *Algae, *Daphnia, *Dieldrin, *Bioassay, DDE, Aquatic

animals, Crustaceans, Water fleas, Carbon radioisotopes, Chlorinated hydrocarbon pesticides, Insecticides, Laboratory tests, Food chains, Water pollution effects.
Identifiers: *Photodieldrin, Bioaccumulation, *Ankistrodesmus amalloides, Daphnia pulex.

The uptake and metabolism of DDT, dieldrin and photodieldrin in a fresh water food chain was investigated with the use of 14C-labeled pesticides. The fresh water alga, Ankistrodesmus amalloides, concentrated 2.5 times more DDT than dieldrin and ten times more DDT than photodieldrin. This was attributed to the solubilities of the pesticides. The time for maximum absorption was 120 minutes for DDT, 30-60 minutes for dieldrin and 30 minutes for photodieldrin. The alga metabolized DDT to both DDE (3.5%) and DDD (0.8%). The fresh water flea, Daphnia pulex, shows a 13.6% conversion of DDT to DDE. (Katz)
W75-09805

AQUATIC INSECT COMMUNITIES OF THE TENRYU RIVER, THEIR COMPOSITION, BIOTIC INDEX AND SEASONAL CHANGE, (IN JAPANESE),
Suzaka High School (Japan).
T. Komatsu.
The Japanese Journal of Limnology, Vol 35, No 4, p 173-184, October 1974. 12 fig, 2 tab, 16 ref. (English abstract).

Descriptors: *Biological communities, *Aquatic insects, *Insect behavior, *Biorhythms, *Water pollution, Speciation, Waste water, Water quality, Industrial wastes, Seasonal, Microenvironment, Data collections, Stations.
Identifiers: *Biotic index, Tenryu River(Japan), *Japan.

During the year 1968-1969 the seasonal change of aquatic insect communities and the biotic index were studied in the Tenryu River, Central Japan, including an area which had been polluted by pulp plant wastes. Number of species was found to range from 2 to 29. Maximum numbers were attained in May, and minimum in July in relatively clean water. The net-spinning caddis-worm Hydropsche ulmeri predominated the area. (Katz)
W75-09807

LOSS OF FIVE PESTICIDES FROM CULTURES OF TWENTYONE PLANKTONIC ALGAE,
Syracuse Univ. Research Corp., N.Y. Life Science Div.
For primary bibliographic entry see Field 5A.
W75-09808

DIVERSITY OF MARINE INVERTEBRATES IN A THERMAL EFFLUENT,
Delaware Univ., Lewes. Coll. of Marine Studies.
D. T. Logan, and D. Maurer.
Journal Water Pollution Control Federation, Vol 47, No 3, p 515-523, March 1975. 2 fig, 5 tab, 31 ref.

Descriptors: *Heated water, *Invertebrates, *Biological communities, *Benthos, *Temperature, *Environmental effects, Analytical techniques, *Thermal pollution, Water pollution effects, Effluents, Water quality control, Bioindicators, Pollutants, Marine animals.
Identifiers: *Diversity index, Thermal effluents.

In order to test the hypothesis that species diversity may be used to determine the effect of a pollutant on a community, the effect of a thermal effluent on an estuarine benthic community was recorded. Data showed that an unusually high diversity may exist in a thermal effluent at the mouth of the discharge canal. Differences in species composition, an increase in relative numbers of a pollution indicator organism, and reduction in species number and the total number of organisms in the effluent were noted. This change in community structure was not necessarily reflected by a decrease in diversity. It is premature to rely exclusively on a diversity index when one is evaluating the effect of a pollutant on a community. (Katz)
W75-09809

DIFFERENTIAL UPTAKE OF ENDOSULFAN BY THE TISSUES OF MYTILUS EDULIS,
Queen's Univ., Belfast (Northern Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W75-09810

5D. Waste Treatment Processes

TREATMENT AND SAFE DISPOSAL OF CATIONIC COATING COLORS,
Merck and Co., Pittsburgh, Pa.
R. H. Windhager.
Preprint, Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1975, p A161-165, 3 fig, 5 ref, 3 tab.

Descriptors: *Pulp wastes, *Cations, *Waste water treatment, *Neutralization, Industrial wastes, Wastes, Waste treatment, Clays, Toxicity, Fish, Water pollution sources, Pollutants, Colorimetry, Analytical techniques, Water pollution treatment, Colorimetry, Polymers, *Waste disposal.
Identifiers: Hydroxyethyl starch, Polyacrylamide, Lignosulfonates, Black liquor, Coating colors, Broke, Repulping, Reprographic papers, Coated papers, Dielectric papers, Electrophotographic papers.

Strongly cationic coating colors are widely used in the manufacture of conductive substrates for Electrofax, dielectric, and other reprographic papers. The long-chain quaternary ammonium polymers give the best conductive response over a wide relative humidity range, and are the products of choice for these applications. Methods of neutralizing cationic coating color wastes with clays, hydroxyethylated starch, polyacrylamide, lignosulfonate derivatives, and kraft black liquor are discussed. Unless these wastes are properly inactivated before discharge into a body of water, they can have a toxic effect on fish life. Two colorimetric tests for detecting non-neutralized cationic polymers in aqueous media are presented. In addition, the optimum repulping conditions for safe reuse of broke coated with cationic polymers are given. (Witt-IPC)
W75-09352

CLOSING UP A FINE GRADE PAPER MACHINE SYSTEM,
MacMillan Bloedel Ltd., New Westminster (British Columbia).
For primary bibliographic entry see Field 3E.
W75-09353

RECYCLING A SOLID WASTE FROM A PAPER PLANT -- SEPARATION OF WOOD FIBER FROM CLAY BY DIFFERENTIAL FLOCCULATION,
British Columbia Univ., Vancouver. Dept. of Mineral Engineering.
S. R. Rao, and A. A. Winer.
Preprint, Canadian Pulp and Paper Association, Annual Meeting (Montreal), 1975, p B25-30, 7 fig, 6 ref, 3 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Clays, *Separation techniques, Flocculation, Cationic adsorption, Water pollution sources, Industrial wastes, Waste treatment, Solid wastes, Sludge, *Recycling, Pollution abatement, Sludge treatment, Water reuse.
Identifiers: Polyacrylamide.

A sludge sample obtained from a fine paper mill was separated into its wood fiber and clay components by flocculation. The best separation was made by means of a differential flocculation technique at pH 8, using a cationic flocculant (a polyacrylamide of low molecular weight). The best products obtained were 81% wood fiber and 19% adhering clay in the flocculated portion, and 78% clay and 22% wood fiber in the unflocculated portion. (Sykes-IPC)
W75-09354

BIOLOGICAL TREATMENT OF SPENT BISULFITE LIQUOR (TRAITEMENT BIOLOGIQUE DE LA LIQUEUR RESIDUELLE AU BISULFITE),
S. N. Los, J.-J. Garceau, and G. Pineault.
ATIP (Association Technique de l'Industrie Papetiere) Revue, Vol 29, No 2, p 55-60, 1975. 7 fig, 10 ref, 3 tab.

Descriptors: *Biological treatment, *Pulp wastes, *Sulfite liquors, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Activated sludge, Biochemical oxygen demand, Oxygen requirements, Microorganisms, Carbohydrates, Laboratory tests, Water pollution treatment, Water pollution control, Lignins.
Identifiers: Lignosulfonates, High-yield pulping, Sodium bisulfite.

A laboratory study was made of biological treatment of spent liquor from high-yield sodium bisulfite pulping of wood using a conventional activated sludge system with four continuously operating 10-liter cells arranged in parallel. Data were obtained on levels of BOD removal, production of activated sludge, oxygen consumption, reaction rate, and feed-rate:microorganism, BOD:carbohydrate, and BOD:lignosulfonate ratios. Parameters studied included incoming liquor and sludge concentrations and residence time. BOD reduction ranged from 70-77% for the 4 cells. Oxygen consumption was 0.11 mg oxygen per mg of 5-day BOD removed. The results should be of use in designing an industrial-scale system. (Speckhard-IPC)
W75-09355

WASTE WATER CLARIFICATION BY FLOTATION (FLOTACIOS SZENNYVIZTISZTITAS),
K. Engelhoffer.
Papiripar, Vol 18, No 5, p 254-262, 1974. 12 fig.

Descriptors: *Pulp wastes, *Flotation, Water pollution treatment, Water pollution, Water purification, Water pollution sources, Industrial wastes, Wastes, *Waste water treatment, Technology, Economics, Recycling, Pulp and paper industry.
Identifiers: *White water, *Fiber recovery.

White water clarification and fiber recovery by flotation is gaining in importance over traditional sedimentation methods. Technological and economic advantages of flotation are indicated. High-pressure flotation has been used successfully at 4 paper mills both for treating of recycleable water and as final effluent purification. (Brown-IPC)
W75-09356

PAPER MACHINE CIRCULATION SYSTEMS -- FLOWS, CONSISTENCIES, RECOVERY, AND POLLUTION (LES CIRCUITS DE LA MACHINE A PAPIER -- DEBITS, CONCENTRATIONS, RECUPERATIONS ET POLLUTIONS),
For primary bibliographic entry see Field 3E.
W75-09357

USE OF CENTRIFUGES FOR PURIFICATION OF EFFLUENTS (PRIMENENIE TSENTRIFUG DLYA OCHISTKI STOCHNYKH VOD),
Vyskumny Ustav Papieru a Celulozy, Prague (Czechoslovakia).
J. Trca, and J. Kirchnerova.

Bumaznnaya Promyshlennost, No 2, p 30-31, February, 1975.

Descriptors: *Centrifugation, *Suspended solids, *Dewatering, *Sludge treatment, *Water purification, Foreign research, Foreign countries, Europe, Water pollution treatment, Water pollution control, *Waste water treatment, Efficiencies, Costs, Wood wastes, Water pollution sources, Bark, Pilot plants, Treatment facilities, Sludge, Equipment.
Identifiers: Czechoslovakia.

Pilot plant experiments conducted in Czechoslovakia are described in which centrifuges were used for the removal of suspended solids from effluents and for dewatering muds from biological purification. The best type of centrifuge for this purpose is a continuous apparatus with a screw type discharge of the sediment. It has been reported in the literature that the main drawback of centrifuges is a worsening of the efficiency of purification equipment where the centrifuge filtrate is recycled. This was not observed in the experiments conducted. Also the reported higher costs of centrifugation as compared with filtration were not confirmed. The costs were actually lower. With the use of coagulating agents a dryness of up to 42% can be obtained for sedimentation muds. At present continuous centrifuges with screw discharge are being tested at biological purification plants for dewatering of excess activated sludge and muds formed during purification of effluents from wood barking. The procedure used in the second case is described. It is pointed out that a wider application of this type of purification depends on the development and production of more efficient new centrifuges. (Stapinski-IPC)
W75-09358

OPTIMUM CONDITIONS FOR CHEMICAL PURIFICATION OF EFFLUENTS (OPTIMAL'NYE USLOVIYA KHIMICHESKOI OCHISTKI STOCHNYKH VOD),
M. B. Berov, V. M. Shapchenko, and V. V. Lobko.
Bumazhnaya Promyshlennost, No 2, p 17-19, February, 1975. 5 fig.

Descriptors: *Pulp wastes, *Waste water treatment, Industrial wastes, Wastes, Water pollution treatment, Color, Lignin, Hydrogen ion cencentration, Neutralization, Chemical reactions, Water pollution sources, Water pollution, Biological treatment, Lime.
Identifiers: *Aluminum sulfate, Kraft mills, Sodium hydroxide, *Chemical treatment.

Chemical purification of kraft mill effluents, which have been purified biologically, is done by treatment with aluminum sulfate. The best results from the viewpoint of decoloration, lignin separation, and minimum residual aluminum are obtained at a pH of 5.5-5.8. Following decoloration and sedimentation, the purified effluent is neutralized with NaOH or lime to raise the pH to 6.5-7.5, a level required for the effluent discharge. A study of the purification system at a kraft mill showed that the pH of the effluent-aluminum sulfate mixture does not remain stable but increases steadily, although very slowly. The value of the final pH depends linearly on the initial pH; at an initial pH of 5.8 the final pH is 6.2-7.1. This steady increase of the pH is explained by the reaction of H ions with the dissociated (sodium form) hydroxyl groups of lignin. Because of the slowness of the process, the pH reached during the residence time of the effluent in the decoloration-sedimentation zone is not the equilibrium pH. However, it is high enough to eliminate the need for neutralization, provided the initial pH is sufficiently high i.e., not lower than 5.8. This will make it possible to eliminate the neutralization stage, thus reducing the mineralization of the purified effluent. (Stapinski-IPC)
W75-09359

POSSIBILITIES FOR REDUCING 5-DAY BOD-CONSUMING MATERIALS IN STEAM CONDENSATES FROM SPENT SULFITE LIQUOR EVAPORATION (MOEGLICHKEITEN DER REDUKTION DER BSB(5)-VERBRAUCHENDEN STOFFE IN BRUNDENKONDENSATEN AUS SULFITABLAUGENEINDAMPFUNGEN),
R. Hornke, and W. Kunstner.
Wochenblatt fur Papierfabrikation, Vol 103, No 6, p 195-199, March 31, 1975. 5 fig, 7 tab.

Descriptors: *Biochemical oxygen demand, *Sulfite liquors, *Evaporation, Water pollution sources, Water pollution control, Industrial wastes, Wastes, Pulp wastes, Biological treatment, Neutralization, Foreign countries, Europe, Water pollution treatment, Waste water treatment, Water quality control, Water pollution.
Identifiers: *Steam condensates, Sulfite mills, *Austria.

Significant amounts of oxygen-consuming substances are present in the acid steam condensate from sulfite mills. This tends to lower the quality of water streams which are usually rendered polysaprobic (very strongly polluted) by pulp mill discharges. By neutralization and biological treatment of the steam condensate before disposal, it was possible to improve stream quality considerably, from 180 5-day BOD (tons/day) to 5.5 at the Chemiefaser Lenzing mill in Austria. (Ward-IPC)
W75-09360

WHERE ARE WE IN FOREST FERTILIZATION,
State Univ. New York, Syracuse. Coll. of Environmental Science and Forestry.
A. L. Leaf.
Proceedings of the Canadian Forest Fertilization Workshop (Sault Ste. Marie), January 8-10, 1974, p 1-5, 22 ref.

Descriptors: *Municipal wastes, *Industrial wastes, *Fertilizers, *Forest management, *Waste disposal, Wastes, Water pollution sources, Water pollution control, Reviews, Environmental effects, Fertilization, Waste treatment.

A brief review of the current status of forest fertilization is presented. Two significant aspects of the discussion include the use of sewage and industrial effluents as potential fertilizing materials, and the environmental impact of forest fertilization. (Sykes-IPC)
W75-09367

S(OCIETE) I(NDUSTRIELLE DE) C(ELLULOSE D') A(LIZAY, FRANCE): NEW STEP IN REDUCING POLLUCTION (S.I.C.A.: NOUVELLE ETAPE DANS LA DEPOLLUTION).
Papier, Carton et Cellulose, Vol 24, No 1/2, p 56-59, January/February, 1975. 7 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Water purification, Industrial wastes, Wastes, Water pollution sources, Water pollution treatment, Waste treatment, Odor, Costs, Pollution abatement, Water pollution control, Foreign countries, Europe, Treatment facilities.
Identifiers: Turbo-circulator clarifier, Noise, Kraft mills, Sulfite mills.

The new Turbo-circulator racle type of effluent clarifier installed at a French bisulfite and kraft pulp mill (with cross chemical recovery) is described. Future effluent treatment plans, noise and odor control efforts, and the cost of the mill's antipollution program are also indicated. (Speckhard-IPC)
W75-09369

CLEANING OF CIRCULATION WATER AND EFFLUENT FROM PAPER AND BOARD MILLS BY CHEMICOPHYSICAL METHODS (DIE MOEGLICHKEIT DER REINIGUNG VON KREISLAUF- UND RESTABWASSER BEI PAPIER- UND KARTONFABRIKEN UNTER BERUECKSICHTIGUNG CHEMISCH-PHYSIKALISCHER VERFAHREN),
Sulzer Bros. Ltd., Winterthur (Switzerland).
B. Morgeli.
Available from IPC, Appleton, Wis 54911, for $8.00 in paper copy. English translation of Das Papier, Vol 29, No 3, p 100-104, March 1975. 4 fig, 7 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Recirculated water, *Water treatment, Industrial wastes, Industrial water, Water pollution sources, Water pollution treatment, Flocculation, Filtration, Absorption, Water pollution control, Legislation, Pulp and paper industry, Recycling.

The regulations governing effluent wastes have become more stringent, requiring corresponding changes in the paper and board industry. Chemical-physical effluent treatment processes are discussed. On the basis of theoretical considerations, test results, and mill experience, three are usable in recycling water, viz., flocculation, filtration, and adsorption. Suitably combined with a biological process, these offer solutions to the water pollution problem. (Ward-IPC)
W75-09371

PACKED-BED REACTORS FOR SECONDARY EFFLUENT BOD AND AMMONIA REMOVAL,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. C. Young, E. R. Baumann, and D. J. Wall.
Journal Water Pollution Control Federation, Vol 47, No 1, p 46-56, January, 1975. 13 fig, 1 tab, 11 ref.

Descriptors: *Waste water treatment, Pilot plants, Suspended solids, Nitrification, Sewage treatment, Reviews, Biochemical oxygen demand, Ammonia.
Identifiers: *Packed-bed reactors, *BOD removal, *Ammonia removal.

The use of packed-bed reactors (PBRs) in waste water treatment is reviewed. Results of pilot plant studies are described from investigations conducted: to determine BOD and suspended solids removal characteristics of the PBR-filter system when it is used to polish secondary effluent from biological treatment plants; to determine whether nitrification may be accomplished in PBR units at temperatures below 10 C; to compare the performance and operating characteristics of various PBR media; and, to determine such characteristics of dual-media filters following aerobic PBR treatment of secondary effluents. The PBR and dual-media filter systems provided a high degree of polishing for low-quality secondary effluents. Effluent BOD was reduced to below 5 mg/liter. Nitrification was successful throughout cold weather for an entire winter operation. Effluent ammonia nitrogen concentrations averaged less than one mg/liter. Three PBR media--sand, crushed coal, and loosely-packed plastic--gave almost the same BOD and suspended solids removals. Selection of media thus should be related more to design and operational simplicity and cost than to media size and shape. Operation of packed-bed reactors is relatively simple in comparison with operation of activated sludge systems. (Prague-FIRL)
W75-09379

FERRIC CHLORINE OR LIME FOR CHEMICAL TREATMENT,
Technion Israel Inst. of Tech., Haifa. Environmental Engineering Labs.
N. Narkis, M. Rebhun, and R. Offer.
Water and Sewage Works, Vol 122, No 1, p 43-45, January, 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Lime, *Ferric chloride, Alum, *Sewage treatment, Flocculants, Costs, Sludge treatment, Waste disposal, Organic compounds, *Waste water treatment.

Identifiers: *Chemical treatment.

Direct chemical treatment of raw sewage, as primary treatment, followed by biological or physicochemical treatment has been studied. Chemical flocculation with ferric chloride is compared with lime flocculation according to the parameters: removal characteristics of mineral constituents, including alkalinity, phosphates and Mg++, and efficiencies of removal of sewage organic materials. Selection of the right flocculant is important in waste water treatment. Conventionally, ferric salts, alum, or lime are used. Ferric and aluminum salts act as flocculants through their positively charged polynuclear hydroxo complexes; lime treatment with a high pH causes the formation of positively charged Mg(OH)2, and CaCO3 precipitate. Hydrolyzing flocculants, such as ferric chloride, were compared with lime depending on: contaminants removal efficiencies by flocculation; water quality of the final effluent; economic feasibility; and, ultimate disposal of sludge. The choice of a flocculant is affected by costs and sludge handling. Lime requirements are higher than ferric salts or alum. Primary sludge from alum or iron can be treated anaerobically while lime sludge must be disposed by thickening, followed by filtration, drying and incineration or by acid dissolving. (Prague-FIRL)
W75-09380

FLOW EQUALIZATION.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, May, 1974. 21 p, 7 fig, 2 tab, 11 ref.

Descriptors: *Waste water treatment, *Municipal wastes, Equalization reservoirs, Flow control, Organic loading, Sewage treatment, Treatment facilities, *Reviews.
Identifiers: *Flow equalization.

The main objectives of flow equalization basins for municipal waste water treatment plants are to dampen the diurnal flow variation and the concentration and mass flow of waste water constituents. The result is a more uniform loading of organics, nutrients, and other suspended and dissolved constituents to subsequent processes, thus, flow equalization improves the performance of an existing treatment facility and/or reduces the required size of downstream facilities. Equalization of municipal waste water flows can be divided into three categories: equalization of dry weather flows; equalization of wet weather flows from separate sanitary sewers; and, equalization of combined storm and sanitary waste water. Dry weather flow equalization is discussed. The benefits of dry weather flow equalization including the impact on primary settling and on biological treatment are given. The determination of equalization requirements in terms of the determination of required volume, impact of equalization diurnal concentration variation, basin construction, air and mixing requirements, and pump and pump control systems is discussed. The costs of flow equalization vary considerably from one application to another, depending on the basin size, construction, mixing and aeration requirements, availability of land, location of facility, and pumping requirements. Several case histories of flow equalization are presented. (Orr-FIRL)
W75-09381

NITRIFICATION AND DENITRIFICATION FACILITIES, WASTEWATER TREATMENT.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973, Revised February, 1974. 24 fig, 2 tab, 13 ref.

Descriptors: *Waste water treatment, *Denitrification, *Nitrification, Oxygen, Sludge treatment, Trickling filters, *Reviews, *Treatment facilities.
Identifiers: Settling tanks.

Nitrification and denitrification occur in waste water treatment. Nitrification has been considered beneficial because of the oxygen resource that the nitrates provide. The problems of rising sludge in conventional activated sludge and standard rate trickling filter plants are due to denitrification. The common way of controlling the problem was to limit nitrification. Information is needed on how waste water treatment plants can be designed to accomplish nitrification and denitrification. Factors affecting nitrification kinetics including denitrification and population dynamics, nitrification kinetics, and oxygen nitrification systems are discussed. Design criteria of nitrification systems in terms of the nitrification and settling tanks are described. Denitrification tanks, settling tanks, sludge, and effluent quality are discussed. Nitrification-denitrification facilities can achieve 90% removal of total nitrogen from the waste water treated. (Orr-FIRL)
W75-09382

WASTEWATER FILTRATION, DESIGN CONSIDERATIONS.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, July, 1974. 36 p, 12 fig, 2 tab, 23 ref.

Descriptors: *Waste water treatment, *Filtration, *Filters, *Design criteria, Efficiencies, Costs, Water treatment, Separation techniques, *Reviews.

The efficiency and cost of filtration are a function of the concentration and characteristics of the solids in suspension; the characteristics of the filter media and other filtering aids used, the characteristics of the solids in solution in the water filterd, the characterstics of the filter and its method of operation. Filter design involves finding the operational optimum characteristics and the economic optimum design. The factors necessary for the proper design of granular filters for the filtration of secondary effluents are discussed. Emphasis is placed on the differences between water treatment practices and waste water treatment practices which must be considered for the successful design of waste water filters. Recommendations are: the variable hydraulic and suspended solids load in secondary effluents must be considered; a filter that allows penetration of suspended solids is essential to obtain reasonable filter run lengths; the backwash water flow rate should be large enough to fluidize the coarser-sized grains of each component of the filter media; more uniform media sizes are desirable; auxiliary agitation of the media is essential to proper backwashing; the filtration rate and terminal headloss should be selected to achieve a minimum filter run length of 6-8 hrs. during peak load conditions; and, lower filtration rates or lower influent suspended solids may permit the economical use of gravity filters where multiple filters are needed. (Orr-FIRL)
W75-09383

PHYSICAL-CHEMICAL NITROGEN REMOVAL, WASTEWATER TREATMENT.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, July, 1974. 24 p, 10 fig, 24 ref.

Descriptors: *Nitrogen, *Waste water treatment, *Ion exchange, *Chlorination, Ammonia, Costs, Municipal water.
Identifiers: *Physical-chemical treatment, *Nitrogen removal, *Ammonia stripping, Selective ion exchange, Breakpoint chlorination, Technology transfer.

Three basic physical-chemical nitrogen removal techniques are available for the treatment of waste water. These are: ammonia stripping, selective ion exchange, and breakpoint chlorination. Each approach has the advantage of being based on the removal of nitrogen in ammonia form, eliminating the cost of converting the ammonia to nitrate in the biological treatment step. The techniques are also unaffected by toxic compounds that might disrupt the removal system. All three methods are predictable in performance, and space requirements for the treatment units are less than for biological treatment units. The ammonia stripping process has the advantages of low cost, ammonia removal with minimal dissolved solids addition, simplicity, and reliability. It performs poorly in cold weather and concern has been expressed over ammonia gas discharge. The selective ion exchange process has the advantages of high efficiency, insensitivity to temperature, ammonia removal with minimal dissolved solids addition, and elimination of nitrogen discharges to the atmosphere. Costs of this process are high, and process control and operation are complex. Breakpoint chlorination has low capital costs, high reliability, temperature insensitivity, and releases nitrogen as nitrogen gas. Its disadvantages are the addition of a substantial amount of dissolved solids to the effluent to remove ammonia, public concern over chlorine gas handling, and complex process controls. Costs and applications are discussed for nine United States cities. (Prague-FIRL)
W75-09384

PHYSICAL-CHEMICAL WASTEWATER TREATMENT PLANT DESIGN.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973, Revised January, 1974. 41 p, 8 fig, 13 tab, 13 ref, 1 append.

Descriptors: *Waste water treatment, Facilities, *Design criteria, Coagulation, Filtration, Flocculation, Carbon filters, Adsorption, *Treatment facilities.
Identifiers: *Physical-chemical treatment.

Discussed are typical design parameters for the unit processes involved in the physical-chemical treatment of raw wastes, and how the design engineer may determine the design criteria best suited for a particular waste water. Chapter I deals with the selection of coagulant and discusses the classes of coagulants, lime coagulation, alum coagulation, iron coagulation, and a comparison of coagulant costs. Chapter II discusses carbon adsorption in terms of powdered carbon and column test results. Chapter III mix, flocculation, clarifier sizing, recarbonation, filtration, granular carbon adsorption, and carbon regeneration. The final chapter details the physical-chemical treatment of small waste flows and covers clarification-filtration-carbon treatment, sludge production, and sludge disposal. Design project descriptions are given of plants in Niagra Falls, N. Y. and Fitchburg, Mass. (Orr-FIRL)
W75-09385

UPGRADING LAGOONS.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973. 43 p, 20 fig, 10 tab, 27 ref.

Descriptors: *Waste water treatment, *Lagoons, *Design criteria, Aerated lagoons, *Oxidation lagoons, Efficiencies, *Reviews.
Identifiers: High-rate aerobic ponds, Facultative ponds, Anaerobic ponds, Maturation ponds.

Lagoons are one of the most commonly used secondary waste treatment systems. Waste treatment lagoons can be divided into five general classes depending on the types of biological actions occurring in the lagoon: high-rate aerobic ponds; facultative ponds; anaerobic ponds; matu-

ration or tertiary ponds; and, aerated lagoons. A well-designed lagoon will incorporate physical features that minimize upsets, maintenance, and nuisances, and that maximize operational flexibility, stability, and BOD removal. Physical design features that should be considered include configuration, recirculation, feed and withdrawal variations, pond transfer inlets and outlets, dike construction, supplementation of oxidation capacity, and algae removal. These criteria are discussed in detail in reference to upgrading existing lagoons. Several examples of upgraded lagoons are presented. (Orr-FIRL)
W75-09386

OXYGEN ACTIVATED SLUDGE WASTEWATER TREATMENT SYSTEMS, DESIGN CRITERIA AND OPERATING EXPERIENCE.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
EPA Technology Transfer Seminar Publication, August, 1973, Revised January, 1974. 46 p, 14 fig, 13 tab, 3 ref, 2 append.

Descriptors: *Waste water treatment, *Domestic wastes, *Industrial wastes, *Oxygenation, *Activated sludge, Costs, Economics, Aeration, Water pollution control, *Design criteria, *Operation, *Reviews.
Identifiers: Unox.

The use of oxygen instead of air in the activated sludge process (as in the Unox system) is one example of improved technology to aid in pollution control. The primary distinguishing feature of the Unox system is that high purity oxygen is the source of oxygen for the microorganisms in the aeration basin. The Unox system uses a covered and staged oxygenation basin for contact of oxygen gas and mixed liquor. High purity oxygen enters the first stage of the system and flows cocurrently with waste water being treated through the oxygenation basin. Operating data and experience from specific programs are presented including results from treatment of domestic wastes, food processing wastes, pulp and paper mill wastes, textile wastes, metal processing wastes, and chemical and petrochemical wastes. The proper design and a Unox system requires the following basic information concerning the waste to be treated: waste water quantity; waste water quality; effluent quality required; and, definition of the other unit operations or existing facilities in the treatment plant and their relationship to the Unox system. In addition to process design, process safety, and Unox system scope of supply, economics of the system, specifications for final settling tanks, and specifications for oxygenation tanks are also discussed. (Orr-FIRL)
W75-09387

A GUIDE FOR STATE CERTIFICATION OF WASTEWATER FACILITIES PERSONNEL,
Water Pollution Control Federation, Washington, D.C.
L. L. Guy, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-232 005, $3.75 in paper copy, $2.25 in microfiche. March, 1973. 29 p, 1 tab. EPA Award No 900181.

Descriptors: *State jurisdiction, *Personnel, Water pollution control, *Treatment facilities, Waste water treatment, Guidelines, Legislation, Surveys.
Identifiers: *Certification, Qualifications.

Certification of personnel in water pollution control facilities has become an accepted practice in the United States. Jurisdiction for making certification optional or mandatory is under the auspices of the states. Concern has been voiced that the diversity of programs weakens their effectiveness, and a national association of state programs may be formed. Efforts of the Environmental vocation skills in operating and managing waste water facilities, including planning, training, and certification programs. This guide details the requirements for an effective state program, and is a preliminary to nationally approved guidelines. Discussed are the results of six state surveys conducted since 1972. A model law which promotes the concept of certification but allows each state to determine its details, and types of operator classification from the entry level trainee up to the class IV plant superintendent, with qualifications for each is included. Difficulties with written examinations, renewal requirements, and enforcement problems are discussed. (Prague-FIRL)
W75-09389

SYNTHETIC RESINS AND ACTIVATED CARBON FOR WASTEWATER TREATMENT,
Illinois Univ., Urbana.
V. L. Snoeyink, B. R. Kim, R. L. Hinrichs, and P. Jennings.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-781 196, $4.75 in paper copy, $2.25 in microfiche. Air Force Weapons Laboratory, Kirtland AFB, New Mexico, Report AFWL-TR-74-112, June, 1974. 82 p, 18 fig, 4 tab, 44 ref.

Descriptors: *Waste water treatment, *Adsorption, *Activated carbon, *Resins, Organic wastes, Laboratory tests, Sewage treatment, Municipal wastes, Industrial wastes.
Identifiers: Regeneration.

This study examined the feasibility of using synthetic resins in place of or in combination with, activated carbon for adsorption processes of waste water treatment systems. An in-depth literature review of the use of resins as adsorbents was followed by bench-scale testing of potentially suitable resins using selected test compounds in single-solute systems as well as various types of activated sludge effluent. The choice of resin depends on the type of compounds to be adsorbed. Weak base resins appear to be most suitable for waters which contain a wide variety of organic compounds, such as secondary effluent, many industrial waste waters, and waters containing organic matter of natural origin. Weak base resins not only have the highest capacity and appear to be the most general type of adsorbent for heterogeneous solutions of organic compounds but also seem to have the most favorable properties for regeneration. The adsorption capacity of the resins and the number of species which could be adsorbed by the resins generally appeared to be less than those for activated carbon. Further research needs to be done with resins using the specific waste water to be treated because of the dependence of the performance of the resin on the types of species being adsorbed. (Orr-FIRL)
W75-09390

IMPLEMENTATION OF WATER SUPPLY AND WASTEWATER PROGRAMS IN THE WASHINGTON, D.C. METROPOLITAN AREA.
American Society of Civil Engineers, Washington, D.C. Water Pollution Task Force.
July, 1974. 39 p, 2 fig, 7 tab, 35 ref.

Descriptors: *Treatment facilities, Planning, *Water supply, Municipal water, Investigations, *District of Columbia, Water utilization, *Waste water treatment, *Water treatment.
Identifiers: *Washington(DC).

An evaluation of the existing waste water treatment facilities in the metropolitan Washington area was made and recommendations for improvement are given. The area is served by three water systems which are not connected; the combined available storage of treated water in the separate systems totals only about one day's supply. Based on the fact that peak demands have exceeded the low flow record, the situation is critical. On the basis of past problems, organizational changes, the funding situation, urban planning and growth, and general water use, several recommendations were made. These included: within existing management organizational structure, new means for reacting rapidly to problems should be found; design should be completed and construction begun immediately on interconnections between the three major water systems; a comparison of damages which would occur as a consequence of short-term water shortages versus the costs of a guaranteed fully adequate supply at all times should be made; investigations should begin of waste water treatment methods, to be planned for the entire region; disputes in the future should use as a model the new agreement on waste flows and sludge disposal, now implemented by the District of Columbia, Maryland, and Virginia, in order to facilitate admistrative cooperation; and, decisions regarding both money and space for treatment facilities, must involve the public. (Prague-FIRL)
W75-09392

SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS,
National Field Investigations Center-Cincinnati, Ohio.
A. W. West.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 070, $3.25 in paper copy, $2.25 in microfiche. March, 1971. 12 p.

Descriptors: *Sewage treatment, *Design criteria, *Operation and maintenance, Facilities, *Activated sludge, Biological treatment, Water pollution control, Water quality control, *Treatment facilities, *Waste water treatment.

This work is a reference for sewage treatment plant dependability lectures presented at training sessions, symposia, and workshops. Design considerations necessary to achieve consistently satisfactory plant performance and final effluent quality include the proper treatment processes, a generous plant capacity, essential flexibility, and true controllability of the plant. The treatment process or modification most appropriate to the known waste characteristics and effluent quality requirements should be chosen. Examples include the classic activated sludge process, the complete mix modification and the step aeration modification. Pilot studies on a bench, pilot, or demonstration scale may be performed to resolve uncertainties about the correct process to choose. The suggestions contained in design criteria manuals such as the '10 States Standards' and should be considered as minimum requirements needed to provide adequate safety factors to assure plant dependability. Items discussed under flexibility of a plant include: process; aeration tanks; final clarifiers; return sludge pumping facilities; excess sludge wasting; emergency chemical treatment; sludge handling facilities; equalizing tanks; and holding ponds. The activated sludge system is a controllable process that should have the appropriate meters and accurately controllable gates, valves, pumps, and blowers for optimum performance. Qualified operators are needed to achieve the high quality effluent that can be produced by a properly designed waste treatment plant; dedicated, experienced operators are needed even more at plants which have design defects. (Orr-FIRL)
W75-09393

THE ROLE OF POLYELECTROLYTES IN FILTRATION PROCESSES,
North Carolina Univ., Chapel Hil. Dept. of Environmental Sciences and Engineering.
C. R. O'Melia.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-233 271, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-032, April, 1974. 81 p, 24 fig, 5 tab, 34 ref.

Descriptors: *Filtration, *Waste water treatment, *Polyelectrolytes, *Prettreatment, *Chemical reactions, Polymers, Chemicals, Coagulation, Trickling filters, Particle size, Filters.

Research was conducted to determine how destabilizing chemicals act in augmenting the effectiveness of filtration processes and to examine selected applications of destabilizing chemicals in filtration for the treatment of waste water. The chemical destabilization required for effective filtration was similar to that required for effective coagulation. Chemical pretreatment was necessary for effective filtration of all systems considered in this research. The optimum chemical dosage for a jar test or batch coagulation test is the chemical dosage that will provide the best effluent quality in a filtration process. If polymers are used as destabilizing chemicals, overdosing may occur due to restabilization of the suspended particles. For the cationic polymer series tested, the optimum polymer dosage was independent of the molecular weight of the polymer, but the removal efficiency of filters operated at this optimum dosage increased with increasing molecular weight. When proper chemical pretreatment occurs, conventional filter beds are capable of removing almost all particles applied to them, regardless of suspended particle size. If effective filtration is not achieved, it should be attributed to poor chemical pretreatment. Other conclusions made concern the mechanisms of polymer action in filtration, and the results that can be obtained using polymers as filter-aids. (Orr-FIRL)
W75-09394

CONTROL SCHEMES FOR THE ACTIVATED-SLUDGE PROCESS,
National Environmental Research Center, Cincinnati, Ohio.
R. Smith, and R. G. Eilers.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-236 086, $4.25 in paper copy, $2.25 in microfiche. Report EPA-670/2-74-069, August, 1974. 55 p, 19 fig, 34 ref.

Descriptors: *Computer model, *Activated sludge, Dissolved oxygen, Settling, Separation techniques, Municipal wastes, Control systems, Model studies, *Waste water treatment.
Identifiers: Sludge inventory control, Sludge wasting control.

A time-dependent computer model for the activated sludge process has been used to investigate potential advantages of a number of control schemes. The systems studied by this model include dissolved oxygen control, sludge wasting control, and sludge inventory control. The program input variables are given; quantitative benefits for control schemes are shown. The dissolved oxygen control installed in a typical 25-mgd (1.1 cu m/sec) municipal plant would reduce electrical power consumption for air supply by about 17 percent. If the blower is scheduled in a step pattern, about 11.5% of the electrical power might be conserved. However, the potential is minimal for reduction of dissolved BOD concentration in the effluent stream by means of food and microorganism control, using the final settler for sludge storage. The effectiveness of the final settler for separation of dissolved and suspended fractions of BOD is an important aspect of the simulation for which adequate relationships are lacking. (Prague-FIRL)
W75-09395

AN EVALUATION OF THE HAGERSTOWN, MARYLAND WATER POLLUTION CONTROL PLANT,
National Field Investigations Center-Cincinnati, Ohio.
A. W. West, and R. J. Touhey.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 072, $3.75 in paper copy, $2.25 in microfiche. November, 1973. 31 p, 1 fig, 8 tab, 1 append.

Descriptors: *Waste water treatment, *Water pollution control, *Sewage treatment, Control, Equipment, Sludge, Clarification, Sedimentation, Pumps, Aeration, *Treatment facilities, Water quality standards, *Maryland.
Identifiers: Clariers, Hagerstown(Md).

The City of Hagerstown, Maryland, Water Pollution Control Plant experienced difficulty in maintaining consistent effluent quality between January 1972 and April 1973. Reasons for the difficulties were severe overloading of the primary clarifiers, high organic loads imposed on the secondary system because of primary system deficiencies, hydraulic overloading of the aeration tanks and final clairifiers during periods of sustained high flow, hampering of the process control by an overall lack of flow meters and controls, inability to feed the flow to the various units to maximize the efficiency of the secondary system, and inability to accurately control the return and waste sludge flows. Recommendations included these immediate modifications: two rectangular primary clarifiers should be converted into sludge holding/thickening tanks; the circular primary clarifier should be converted into an additional final clarifier; variable speed drive pumps should be provided; meters and control valves should be installed; modification of the circular primary clarifier piping should include plans for its use as a final clarifier; and two blowers should be repaired to provide additional aeration capacity. Long range modification recommendations were for the installation of: separate pumps and meters for excess sludge wasting; meters and valves or gates to measure and control the various sludge, sewage, and liquor flows; a central meter and control panel to permit remote adjustment of valves and pumps; automatic density controllers to aid in sludge handling; and, new primary sedimentation units to replace the inadequate units. (Orr-FIRL)
W75-09396

WASTEWATER SURVEY, CHANUTE AFB, ILLINOIS.
Environmental Health Lab., Kelly AFB, Tex.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 784, $3.75 in paper copy, $2.25 in microfiche. Report EHL (K) 74-13. July, 1974. 39 p, 3 append.

Descriptors: *Surveys, *Sewage treatment, Sampling, *Treatment facilities, *Water quality standards, Waste discharge, *Illinois, *Waste water treatment, Water pollution sources, Water pollution control, Tertiary treatment.
Identifiers: Storm drainage system, Chanute AFB(Ill).

Data and a discussion of the results of a field waste water survey conducted at Chanute AFB, Illinois, in May 1973 are presented. Physical, chemical, and biological sampling and analyses of the sewage treatment facilities and the receiving stream of the base were accomplished. Existing waste water treatment facilities do not provide an effluent that meets current or projected requirements. Extensive addition and modification or a complete new facility is required to comply with local discharge standards which require as little as four mg/liter BOD5 and five mg/liter of suspended solids in the effluent. This can be achieved with advanced waste treatment methods. In addition, action is required to insure that industrial waste waters are not discharged to the storm drainage system and that the sanitary sewer lift pumps do not overflow to the storm drainage system. (Prague-FIRL)
W75-09397

SURVEY OF WASTEWATER DISCHARGE--ELMENDORF AFB, ALASKA,
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5B.
W75-09398

EVALUATION AND DEMONSTRATION OF THE CAPILLARY SUCTION SLUDGE DEWATERING DEVICE,
Westinghouse Research Labs., Pittsburgh, Pa.
T. E. Lippert, and M. C. Skriba.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-232 358, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-017, March, 1974. 47 p, 30 fig, 5 tab, 3 append.

Descriptors: *Dewatering, *Sludge treatment, *Waste water treatment, *Capillary action, Anaerobic digestion, Pilot tests, Costs.
Identifiers: Sludge drying.

A device for dewatering waste activated sludge used capillary suction in a porous belt. The system has been demonstrated on a pilot scale test unit. The device uses capillary action to initially dewater the sludge, which forms a thin sludge cake. This cake is then mechanically compressed in a final step to obtain a still dryer cake. Both dewatering steps are incorporated into a single system endless belt design. Sludge feed capacities from 2.0 to 4.5 lbs/hr ft have been demonstrated, using the cake solids at discharges ranging from 15 to 18 percent. Results were obtained with a conditioned waste activated sludge at a coagulant cost of approximately $4.00/ton. The device also has been tested on an anerobically digested and a mixed primary-activated sludge. (Prague-FIRL)
W75-09399

WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.
San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6D.
W75-09400

SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER, VOLUME I. SUMMARY AND MAJOR FINDINGS,
For primary bibliographic entry see Field 5E.
W75-09401

SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER. VOLUME II. DATA CONDENSATIONS,
For primary bibliographic entry see Field 5E.
W75-09402

DOMESTIC WASH WATER RECLAMATION FOR REFUSE AS COMMODE WATER SUPPLY USING A FILTRATION-REVERSE OSMOSIS SEPARATION TECHNIQUE,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
J. B. Hall, Jr., C. E. Batten, and J. R. Wilkins.
Available from the National Technical Information Service, Springfield, Va. 22161, as N-74-19607, $3.75 in paper copy, $2.25 in microfiche. NASA TN D-7600, April, 1974. 34 p, 3 fig, 9 tab, 17 ref, 2 append.

Descriptors: *Waste water treatment, *Reverse osmosis, *Filtration, *Water reuse, Water purification, Chlorination, Water conservation, *Water supply, Domestic water, Domestic wastes, *Separation techniques.

An evaluation of a combined filtration-reverse osmosis water recovery system was conducted to determine its capability to reclaim domestic wash water for reuse as a commode water supply. The water produced by this system met all chemical and physical requirements established by the U.S. Public Health Service for drinking water with the

exception of carbon chloroform extractables methylene blue active substances, and phenols. This water is considered to be of a quality able to be reused as commode supply water. The filters used to protect the reverse-osmosis unit from plugging were not capable of removing particles less than one micrometer in size from the waste water. The process rate of the reverse osmosis unit was degraded approximately 46.9% for 713 gallons of filtered wash water processed. Averages of 0.00897 killowatt-hour per gallon and 0.0639 kilowatt-hour per gallon were needed to process the wash water through the filtration unit and reverse osmosis unit, respectively. Treatment of the processed water with 5 ppm chlorine was sufficient to reduce the microorganisms in the commode tank to zero. However, efficient mixing of chlorine was necessary in order to rapidly inhibit microorganisms in the processed water tank. The viability of a combined filtration and reverse osmosis technique for the reclamation of domestic wash water is established by this evaluation. The reverse osmosis module, if sufficiently protected from plugging by a filter capable of removing solid materials less than one micrometer in size, is a good low energy method for removing contaminants form domestic wash water. (Orr-FIRL)
W75-09403

EVALUATION OF MUNICIPAL SEWAGE TREATMENT ALTERNATIVES.
Battelle-Pacific Northwest Labs., Richland, Wash.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-233 489, $10.50 in paper copy, $2.25 in microfiche. February, 1974. 411 p, 35 fig, 6 tab, 219 ref, 3 append. EQC 316.

Descriptors: *Waste water treatment, *Reviews, Costs, *Environmental effects, Municipal wastes, Waste disposal, Ocean disposal, Aeration, Sewage treatment, Evaluation, Landfills, *Cost comparisons, *Cost analysis.
Identifiers: Sanitary landfills.

A comparison was made of alternative waste water treatment strategies. Both their costs and environmental effects were considered. Available municipal waste water and sludge treatment processes were selected on the basis of current or projected use in various sized flow regimes. Included were: primary treatment with land disposal of liquid effluents; waste stabilization lagoons; trickling filters with surface water discharge; trickling filters with land disposal; activated sludge with surface water discharge; activated sludge with land disposal; biological-chemical treatment; activated sludge-coagulation-filtration; tertiary treatment; physical-chemical treatment; extended aeration; sludge thickening, chemical conditioning, vacuum filtration, incineration, and landfill; chemical digestion, and ocean dumping by pipeline; and several other options. Each set of liquid treatment strategies and sludge options was characterized as to resource input requirements and subsequent outputs. (Prague-FIRL)
W75-09404

A PRELIMINARY ASSESSMENT OF WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION,
Curran Associates, Inc., Northhampton, Mass.
P. M. Meier, J. Kuhner, and C. J. Martel.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 496, $6.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-065, July, 1974. 166 p, 36 fig, 25 tab, 2 append.

Descriptors: *Treatment facilities, *Domestic wastes, Waste disposal, Hydraulic conductivity, Planning, Costs, Sewers, Sewage treatment, *Waste water treatment.
Identifiers: *Grinders, Refuse collection, Household grinders.

The most promising wet system alternative for residential refuse collection is described. It involves a system using individual household grinders in low density areas, vacuum collection and neighborhood grinders in high density areas, dilute slurry transport of ground refuse in the existing sanitary sewer systems, and joint treatment of refuse and sewage at an expanded treatment facility, including anaerobic digestion for methane generation. However, the economic feasibility of even the most promising alternative is doubtful because of the high cost of grinding. Hydraulic transport of ground refuse in existing sewer systems may be feasible only if both metals and glass are excluded. A conventional collection of the nongrindable and bulky constituents of residential refuse will still be needed, even if on a diminished frequency. Projected costs are also discussed. (See W75-04577, W75-09406 and W75-09407) (Prague-FIRL)
W75-09405

ECONOMIC ANALYSIS OF THE PROCESSING AND DISPOSAL OF REFUSE SLUDGES,
Curran Associates, Inc., Northampton, Mass.
P. Kos, P. M. Meier, and J. M. Joyce.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 498, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report EPA-670/2-74-037, July, 1974. 69 p, 29 fig, 5 tab, 48 ref.

Descriptors: *Domestic wastes, *Incineration, *Sludge treatment, *Waste disposal, Treatment facilities, *Waste water treatment, Costs, *Cost analysis.
Identifiers: *Wet systems.

The feasibility of sludge handling and disposal at waste water treatment facilities is discussed. These are modified to accept up to 0.5 percent by weight of ground residential refuse in their sewage influents. Using computer simulation techniques, the sensitivity of sluge handling and disposal operations to operating parameters and input conditions is examined. A substantial decrease in the unit cost of sludge handling, on a per ton of dry solids basis, over plants treating sewage alone can be expected. Suitable process chains include gravity thickening, vacuum filtration, and either landfill or incineration. (See also W75-09405) (Prague-FIRL)
W75-09406

WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION: A CASE STUDY FOR SPRINGFIELD, MASSACHUSETTS,
Curran Associates, Inc., Northampton, Mass.
P. M. Meier, J. Kuhner, and R. E. Bolton.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 499, $7.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report EPA-670/2-74-038, July, 1974. 207 p, 37 fig, 34 tab, 26 ref.

Descriptors: *Sewerage, *Domestic wastes, Hydraulic conductivity, Costs, Treatment facilities, Planning, *Massachusetts, *Waste water treatment.
Identifiers: *Springfield(Mass), *Wet systems, *Refuse collection.

A case study implementation of the wet systems concept for residential refuse collection in the Springfield, Massachusetts, urbanized area is detailed. Analyses of the problems of hydraulic transport of ground refuse in the Springfield sewer system; treatment of a modified waste water treatment plant; the impact on resource recovery and conventional solid waste management; socioeconomic, institutional and fiscal ramifications; and a total systems cost analysis showing annual per household costs for refuse and sewage management are given. Implementation of the system on a domestic level, however, is thought to be at least ten years distant, due to unresolved technical uncertainties. A program of further laboratory investigations is recommended. (See also W75-09405) (Prague-FIRL)
W75-09407

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
D. Dworkin, and D. D. Baumann.
Available from the National Technical Information Service, Springfield, Va. 22161. Army Engineer Institute for Water Resources, Contract Report 74-1, December, 1974. 265 p, 31 fig, 33 tab, 6 append.

Descriptors: *Simulation analysis, *Municipal water, Water supply, *Water reuse, Evaluation, Recycling, Systems analysis, Costs, Public health, Engineering, Water demand, Colorado, *Computer models, Model studies.
Identifiers: Colorado Springs(Colo), Economic efficiency.

A simulation model for evaluating the economic efficiency of water reuse is given. This is applicable to a single community for planning its possible recycling system. Two problems related to low community adoption of water reuse are the unavailability of such a method to assess the relative value of reuse and the professional biases of consulting engineers and public health officials. The use of renovated waste water in water supply planning is illustrated by the example of Colorado Springs, Colorado. A simulation model gives a plan as well as an alternative plan for the next fifty years, beginning in 1974. Expected water demand is based on demographic patterns and considers residential, industrial, commerical, municipal, military, and nonpotable use. Costs and benefits are included in the computer models. (Prague-FIRL)
W75-09408

AGRICULTURAL BENEFITS AND ENVIRONMENTAL CHANGES RESULTING FROM THE USE OF DIGESTED SLUDGE ON FIELD CROPS,
Metropolitan Sanitary District of Greater Chicago, Ill.
T. D. Hinesly.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-236 402, $10.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA/530/SW-30d.1, 1974. 375 p, 83 fig, 164 tab, 173 ref.

Descriptors: *Viruses, *Sludge, Land use, Soil, Water, Samples, Public health, Groundwater, Agriculture, Fertilizers, Drainage, Water quality control, Benefits, *Beneficial use, Water reuse.
Identifiers: Digested sludge, Sludge application.

The effects of digested sludge application on the chemical composition of soil, plant, and water samples from a large field lysimeter facility are discussed. Specific hygienic aspects of digested sludge were also investigated. It was found that viruses are not likely to survive the heated anaerobic digester environment. Although digested sludge contains large populations of fecal coliform bacteria, these organisms die rapidly during storage and after spreading on the soil. Results from green house and field studies indicate that several crop plants show favorable growth responses when fertilized with digested sludge. As long as digested sludge application rates do not exceed those which will result in unacceptable concentration levels of NO3-N in drainage or groundwaters, sludge of the quality employed in this study can be safely used to increase the production of quality crops. (Prague-FIRL)
W75-09409

COMPREHENSIVE SURVEY OF MAGPIE CREEK, MCCLELLAN AIR FORCE BASE, CALIFORNIA,
Environmental Health Lab., McClellan AFB, Calif.
C. F. Pauls, and T. R. Doane.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 819, $4.25 in paper copy, $2.25 in microfiche. Professional Report No 73M-2, April, 1973. 53 p, 12 fig, 12 tab, 5 ref, 3 append.

Descriptors: *Surveys, *Domestic water, *Sewage treatment, *Treatment facilities, Streams, Effluents, Waste disposal, Sampling, Water quality standards, California, *Waste water treatment.
Identifiers: Magpie Creek(Calif), McClellan AFB(Calif).

A survey of the McClellan AFB domestic sewage treatment plant was conducted. A study was made of the stream water quality of Magpie Creek, which flows through the base and carries the effluents of McClellan Base's domestic and industrial waste treatment plants. The stream was sampled both biologically (Qualitatively) and chemically (quantitatively). Based on studies on the benthic macroinvertebrates found, the stream shows improved quality upon leaving the base as compared to where it enters the base. The McClellan AFB domestic treatment plant effluents are regulated by the State of California as to BOD concentration, settleable solids, oils, and grease; the survey showed that the Base was within specified limits for all these constituents. Industrial discharges into Magpie Creek, from all industries, were also within water quality standard requirement limits. However, an Industrial Waste Treatment Facility, not yet completely installed, does not have sufficient operational control. In addition, several pipes, sink drains, floor drains and pipe drains have outlets discharging directly into Magpie Creek, from unknown origin. It was strongly recommended that these lines be rerouted to the sanitary or industrial waste sewerage system. This will prevent any spill of toxic materials to the now acceptable waters. (Prague-FIRL)
W75-09410

WASTEWATER TREATMENT FACILITY EVALUATION, MALMSTROM AFB MT,
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 5E.
W75-09411

PHOSPHATE REMOVAL IN AN ACTIVATED SLUDGE FACILITY,
Municipality of Metropolitan Seattle, Wash.
R. E. Finger, G. J. Mason, D. A. Carlson, and G. L. Minton.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 749, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA 670/2-74-061, August 1974. 92 p, 23 fig, 17 tab, 132 ref.

Descriptors: *Activated sludge, *Alum, *Ferric chloride, Phosphorus, Biological treatment, Chemical treatment, Sludge, Phosphates, *Waste water treatment.
Identifiers: *Phosphorus removal.

Both the biological and the chemical means of phosphorus removal were studied for the activated sludge facility at Seattle's Renton, Washington plant. Tests conducted on secondary activated sludge ranged, from jar tests to full scale plant investigation. Results indicate that the observed removal of phosphorus in this soft water area activated sludge facility is mainly biological. Careful control of organic loading rates, air application rates and excess sludge wasting rates can increase removal somewhat. However, even under optimal conditions, the biological mechanism does not consistently reduce the phosphorus concentration to a desired 1.0 mg/liter. Both ferric chloride and alum can effectively remove the phosphorus, and are controlled by automation. Sludge is produced with the addition of either alum or ferric chloride, with the former causing a denser final sludge. Capital costs for either chemical are the same, but alum requires a larger storage tank area. It was also recommended that the use of polyelectrolytes in conjunction with alum or ferric chloride be investigated. (Prague-FIRL)
W75-09412

SURVEY OF WASTEWATER DISCHARGE, CAMPION AFS, ALASKA,
Environmental Health Lab., Kelly AFB, Tex.
C. F. Pauls, and J. F. Thomas.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 785, $3.25 in paper copy, $2.25 in microfiche. Technical Report EHL(K) 74-14, July 1974. 8 p, 2 ref, 4 append.

Descriptors: *Waste discharge, Water quality control, Surveys, Waste disposal, Domestic wastes, *Waste water treatment, *Sewage treatment, Water quality standards, Monitoring, Sampling, *Alaska, Tertiary treatment.
Identifiers: Campion AFS(Alas), Model B-Oxigest Treatment.

A survey of waste water discharge at Campion AFS, Alaska, was conducted between June 27 and June 29, 1973. Most of the waste waters from Campion are discharged to a sanitary sewage treatment system. Secondary treatment of domestic waste water generated by 130 persons is provided by a Model B-Oxigest package treatment system. Water pollution monitoring was evaluated in order to comply with water quality criteria of Alaska. In addition, industrial operations which generated waste water were investigated. With the exception of waste brines generated by a water softening plant, non-domestic or industrial sources of pollutants were insignificant. Although Campion AFS had no records of former sewage treatment plant performance and had conducted no previous laboratory testing of effluent water quality, the sewage treatment outfall proved to be clear and showed no evidence of undesirable conditions. It was recommended that water quality be monitored, and that sampling be conducted of the sewage treatment system to assure future water quality control. (Prague-FIRL)
W75-09413

RECENT DEVELOPMENTS IN SEWAGE TREATMENT BASED ON PHYSICO-CHEMICAL METHODS,
Water Pollution Research Lab., Stevenage (England).
P. F. Cooper, and E. V. Thomas.
Water Pollution Control, Vol 73, No 5, p 505-520, 1974. 7 fig, 11 tab, 17 ref.

Descriptors: *Sewage treatment, Activated carbon, Pilot plants, *Waste water treatment, Clarification, Treatment facilities, Biological treatment, Costs.
Identifiers: Great Britain, *Physico-chemical treatment.

Physico-chemical treatment for sewage is defined as chemically aided clarification followed by the removal of dissolved organic material usually by adsorption on activated carbon. Physico-chemical treatment (PCT) is more common in the United States than in Great Britain, but is still at the pilot plant stage. Advantages claimed for PCT over biological treatment include reductions in capital costs and land requirements; easier control of the plant in terms of adapting to fluctuations in sewage quantity and quality; reduced susceptibility of the chemical stage to toxic materials; and, almost complete removal of phosphorus and some removal of nitrogen where eutrophication is a problem. Recent developments in the United States and tests in Great Britain are described. Pilot plants in the UK include one at the Coleshill works of the Upper Tame Main Drainage Authority and the Cramlington works of the Seaton Valley Urban District Council of Northumberland. The PCT process may be applicable for primary clarification to permit discharge to coastal waters through a shorter outfall pipe, in the use of a chemical coagulant in the primary sedimentation stage to relieve an overloaded conventional plant, or by the use of PCT with a biological stage to remove carbonaceous and possibly nitrogenous constituents prior to activated carbon treatment. (Prague-FIRL)
W75-09414

PHOSPHORUS REMOVAL DEMONSTRATION STUDIES AT C.F.B. TRENTON,
Environmental Protection Service, Ottawa (Ontario).
W. E. Stepko, and E. E. Shannon.
Technology Development Report EPS 4-WP-74-9, September 1974. 35 p, 14 fig, 12 tab, 7 ref.

Descriptors: *Alum, *Activated sludge, Treatment facilities, *Canada, Monitoring, Biochemical oxygen demand, Suspended solids, Digestion, Waste water treatment, Phosphorus.
Identifiers: *Phosphorus removal.

Full scale phosphorus removal studies, employing alum addition to an activated sludge treatment plant, were conducted at Canadian Forces Base (C.F.B.) Trenton. Treatment plant performance was closely monitored with respect to BOD5, total phosphorus, and suspended solids removals, under baseline conditions, and at various alum addition levels. The required alum dosage for phosphorus removal was 3.0 to 3.5 mg/liter as Al and the most effective addition point was at the exit end of the aeration basins. Alum additions improved suspended solids removal efficiencies and maintained BOD5 and turbidity removal efficiencies at baseline levels. During periods of zero alum addition, a residual phosphorus removal effect was observed. An in-depth investigation of this effect was recommended to determine if phosphorus removal requirements can be met at reduced alum dosages. Digester capacity was inadequate and digester supernatant quality was poor, so that 70% of the phosphorus removed from the plant in the raw sludge eventually recycled back to the primary clarifier. A proposed solution to this problem was the addition of a second digestion stage to the plant. (Prague-FIRL)
W75-09416

REMOVAL OF WASTEWATER ORGANICS BY REVERSE OSMOSIS,
Baker (Michael), Jr., Inc., Beaver, Pa.
W. A. Duvel, Jr., and T. Helfgott.
Journal Water Pollution Control Federation, Vol 47, No 1, p 57-65, January, 1975. 5 fig, 1 tab, 19 ref.

Descriptors: *Waste water treatment, *Reverse osmosis, Organic wastes, Phenols, Municipal wastes, Industrial wastes, Permeability, Solutes.

Although the advantages and limitations of reverse osmosis as both a separation and a concentration technique have been established, the efficiency of removal of specific organics such as those that might be found in municipal and industrial waste waters is not well known. This investigation was undertaken to answer the following questions: What characteristics of a solute molecule cause to be rejected or allow it to pass through membranes in the reverse osmosis process; Why are some solutes rejected and others not; and, By what mechanisms do molecules actually pass through the membrane. Solute rejection was found to be semiquantitatively related to both molecular weight and molecular size; molecular size, as determined by steric geometry, was the more important factor. The chemical characteristics of a

molecule , particularly its ability to form hydrogen bonds, are qualitatively important in determining permeability. A descriptive mechanism of membrane permeation explins the transport of organic materials through reverse osmosis membranes. This theory makes it possible to predict the success of reverse osmosis in treating waters contaiminated by soluble and colloidal organic matter, as long as the chemical nature of the individual contaminants is known. In addition, a constituent which is permeable might be chemically modified to a nonpermeable form. For example, phenol which is a highly permeable solute could be oxidized with ozone or chlorine dioxide to alter it chemically to a less permeable solute. (Orr-FIRL)
W75-09417

REDUCTION IN SURFACTANTS BY IRRADIATION,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
D. M. Rohrer, and D. D. Woodbridge.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 1, p 31-36, January, 1975. 2 fig, 14 ref.

Descriptors: *Waste water treatment, *Detergents, *Surfactants, *Irradiation, Domestic wastes, Municipal wastes, Surface tension, *Linear alkylate sulfonates.

Although detergents have been determined to be some of the largest contributors to water pollution, the pollution is not produced by the total chemical constituents of the detergents but rather by certain specific chemical structures. Linear Alkylate Sulfonate (LAS) is used as a wetting agent in certain detergents because it creates an effective surface barrier at the water/air interface. This study was designed to investigate the effect of ionizing radiation on Linear Alkylate Sulfonate to overcome the surface tension effect of detergents. More than 200 aqueous samples containing LAS at concentrations of 2.5, 5.0, 7.5, and 10.0 mg/liter were irradiated such that they absorbed 10, 20, 40, 60, 80, and 100 K rads of energy. The results showed that radiation can effectively reduce the concentration of LAS in aqueous solutions. It was also demonstrated that the rate of irradiation is not nearly as important in the reduction of LAS as is the total absorbed energy. (Orr-FIRL)
W75-09418

VOLUME EXTRACTION OF CHEMICALLY CONTAMINATED WATER,
Westinghouse Electric Corp., Abingdon, Va. Wire Div.
L. W. Shelley, Jr.
Wire Journal, Vol 8, No 3, p 67-75, March, 1975. 8 fig, 1 tab.

Descriptors: *Waste water treatment, *Separation techniques, *Chemical wastes, Industrial wastes, *Waste disposal.

An industrial accident, in which a valve was opened allowing 500 gal of an emulsified cresylic acid and ortho-dichlorobenzene solution to enter a plant's sewage system and contaminate a 300,000 gal holding tank, created a massive treatment/disposal problem for Westinghouse Electric Corporation. The original plans called for storage and subsequent decontamination of this water by transporting it to a 500,000 gal plastic-lined dry pond, approximately 480 ft above the water table. However, this plan was not acceptable to the Public Health Department. Laboratory tests showed that decontamination could be accomplished by extraction with methylene chloride. 17,000 gal of methylene chloride were pumped into the contaminated tank. The water was agitated by two large compressors pumping air into the 300,000 gal of water. Mixing continued for a period of about six hours. The air compressors were turned off and the water layer and methylene chloride layer were allowed to separate for two hours. The methylene chloride was siphoned from the bottom of the holding tank by running a rubber hose to the bottom and pumping it into tank trucks which then carried the contaminated methylene chloride away to be reclaimed. After the removal of all possible methylene chloride, the air compressors were turned on again to agitate the extract and aerate the solution to remove by evaporation trace amounts of methylene chloride still in solution. (Orr-FIRL)
W75-09419

FILTER-PRESSING WASTEWATER SLUDGE.
Water and Sewage Works, Vol 121, No 9, p 108-111, September, 1974. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Sludge disposal, *Sludge treatment, *Dewatering, *Filtration, Chemicals, Sewage treatment, Suspended solids, Biochemical oxygen demand, *Wisconsin, Landfill.
Identifiers: *Filter pressing, Edwards and Jones filter press, Kenosha(Wisc).

The Kenosha, Wisconsin, waste water treatment plant is the first one in the United States to dewater sewage sludge by filter pressing with the Edwards and Jones filter press. The Edwards and Jones filter press process was chosen because of the limited number of personnel required and the use of ferric chloride and lime instead of fly ash as conditioning chemicals. The sludge is continuously fed into the press at a maximum of 100 psi; as the sludge goes into the press, the solids are retained on the cloths and the filtrate comes out and goes into the head end of the plant to be recycled with the raw sewage. The complete cycle takes 3-4 hours. The moisture content of the sludge cakes is about 60%; the dry cake is disposed of as landfill. Used in the chemical conditioning are 50,000 ppm of ferric chloride on a dry weight basis and 120,000-150,000 ppm lime. The press has a capture rate of at least 99% of the incoming solids. Suspended solids for the filtrate are around 130 mg/liter and BOD is around 58-79. The cloth used to filter the waste water is a polypropylene monofilament of a low to medium porosity and will last a year and a half or two years. (Orr-FIRL)
W75-09420

TECHNOLOGICAL AND ECONOMIC EFFECTS OF THE CHANGE OF THE PRELIMINARY PURIFICATION TIME ON SLUDGE TREATMENT (TECHNOLOGISCHE UND OEKONOMISCHE AUSWIRKUNGEN DER VERAENDERING DER VORKLAERZEIT AUF DIE SCHLAMMBEHANDLUNG),
H. Hagen.
Wasserwirtschaft-Wassertechnik, Vol 24, No 8, p 277-279, 1974. 4 fig, 1 tab, 10 ref.

Descriptors: *Sludge treatment, *Costs, Waste treatment, Organic matter, Aerobic treatment, *Waste water treatment.
Identifiers: Activation basins, Sludge quantity, Residence time.

Sludge quantity within a waste water treatment plant depends upon the origin, the quantity of dry substance, and the water treatment plant depends upon the origin, the quantity of dry substances, and the water content of the sludge. Sludge originating from mechanical purification is different from excess sludge after purification. The quantity of sludge from preliminary purification decreases with decreasing residence time in the preliminary purification basin. An optimization calculation was carried out to determine the residence time in the preliminary purification basin at which the sum of the costs for preliminary purification and for sludge treatment approach a minimum. An optimum preliminary purification time of one to two hours was obtained, assuming a dry substance content of 5.7% in mixed sludge and 2.5% in excess sludge. Thus, the volume of the preliminary purification basin influences the composition of the sludge to be digested. If the residence time in the preliminary purification basin drops, the quantity of organic matter going to the aerobic stage rises, and with it the quantity of excess sludge to be removed from the activation basin. (Nave-FIRL)
W75-09421

DRIP IRRIGATIONS INHERENT REQUISITE - WATER QUALITY,
Scientific Irrigation Systems, El Monte, Calif.
G. O. Fraser.
In: Proceedings of the Second International Drip Irrigation Congress, p 81-85, (1974).

Descriptors: *Coagulation, *Flocculation, *Filtration, Agriculture, Irrigation water, Water quality, Waste water treatment.
Identifiers: *Drip irrigation, *Trickle irrigation.

Discussed are reasons why water quality is of the utmost importance and what factors cause deterioration of water quality. Methods of filtering irrigation water are presented. (See also W75-09423) (Skogerboe-Colorado State)
W75-09435

AUSTRALIAN VINEYARD USES SEWAGE EFFLUENT WITH TRICKLE IRRIGATION,
Kinnaird, Hill, deRohan and Young Ltd., Kensington and Norwood (Australia).
For primary bibliographic entry see Field 3C.
W75-09486

EVALUATION OF RECOVERY IN A POLLUTED CREEK AFTER INSTALLATION OF NEW SEWAGE TREATMENT PROCEDURES,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 5B.
W75-09515

DISPOSAL OF CATTLE FEEDLOT RUNOFF ON AGRICULTURAL LAND,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
H. D. Wittmuss.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 501, $4.25 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 50 p, 11 fig, 26 tab. OWRT A-029-NEB(2). 14-31-0001-5027.

Descriptors: *Farm wastes, *Feed lots, Waste disposal, Crop production, Pollution effluents, Sprinkler irrigation, Nutrients, Deep percolation, Absorption, *Agricultural runoff, Corn(Field), Chemical analysis, Waste treatment.
Identifiers: Feed lot runoff, *Effluent irrigation.

Cattle feedlot runoff was applied to sod planted corn for three years at rates up to 30 inches per year without pollution of soil, crop, surface water or groundwater. Data were collected on many areas of crop production to check the effect of effluent irrigation compared to water irrigation on sod planted corn. All tests to date show no discernible difference in forage or grain nutrient content. The grain yield was suppressed 20% or more by the sprinkler application of effluent every two weeks, compared to water irrigated plots, during the growing season. Water and effluent were applied to sod planted corn in ten applications with maximum applications of 30 inches a year for three years. The application was measured and analyzed chemically for nutrients. Forage and grain yields were determined and each was analyzed for nutrient composition. The percentage of crop uptake of applied nutrients was determined and ranged from 1 to over 100 percent and could be related to crop response in many cases. Percolate samples were collected from the 7-foot depth and analyzed chemically showing a slight increase in the nitrogen content below the effluent plots. The chemical composition of the soil was determined before, during and after the study.

W75-09517

BIOLOGICAL CONTROL OF SPHAEROTILUS NATANS AND RELATED SPECIES IN WASTE WATERS,
Nebraska Univ., Lincoln. School of Life Sciences.
T. L. Thompson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 503, $3.25 in paper copy, $2.25 in microfiche. Completion Report, June 30, 1975. 13 p, 2 fig. OWRT A-030-NEB(1). 14-31-0001-5027.

Descriptors: *Biocontrol, *Bacteriophage, Sphaerotilus, *Waste water treatment, Isolation, Pollutant identification, *Aeration.
Identifiers: *Sphaerotilus natans, Extended aeration.

Six bacteriophage specific for Sphaerotilus natans were isolated. One bacteriophage, SNV1, was characterized in detail. Experiments employing an extended aeration unit were conducted to determine the practicality of biological control of Sphaerotilus under simulated field conditions. Streptomycin resistant Sphaerotilus was employed as seed in the system. Numbers of surviving Sphaerotilus, numbers of bacteriophage, sludge volume index and suspended solids were measured over several weeks. Results indicate that bacteriophage control of Sphaerotilus in systems which have a high flow-through rate is impractical because of the high wash-out rate of the bacteriophage.
W75-09520

UPFLOW FILTRATION OF OXIDATION POND EFFLUENT,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. McGhee.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 529, $3.25 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 12 p, 6 tab, 3 ref. OWRT A-034-NEB(1). 14-31-0001-5027.

Descriptors: *Waste water treatment, Oxidation, Solid wastes, *Filtration, *Oxidation lagoons, Treatment facilities, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, *Nebraska, Municipal wastes.
Identifiers: *Upflow filtration systems.

An upflow filtration system employing a sand medium was constructed and operated at the Municipal Oxidation Ponds in Lincoln, Nebraska. The system was operated at loading rates of 0.5 to 3.0 gal/ft sq/min (6.25 to 37.5 gal/min) and backwashed at a rate of approximately 15 gal/ft sq/min (190 gal/min). Flow was provided by electrically driven centrifugal pumps. Routine data measures included COD and suspended solids of influent and effluent and BOD of influent and effluent when the solids concentration in the effluent met current discharge standards (30 mg/l). Modifications to the system made during the study included the addition of a steel grid to restrain the filter medium against premature expansion and substitution of a coarser sand (.5mm) for that originally used (.22mm). Conclusions were: (1) the suspended solids and BOD of oxidation pond effluent may be reduced by filtration through a sand medium; and (2) efficiency of removal decreases sharply with increased filtration rate.
W75-09522

A COVERED DOMESTIC LAGOON SYSTEM FOR NATURAL GROUND WATER RECHARGE NEAR METROPOLITAN AREAS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
R. Laak.
Available from the National Technical Information Service, Springfield, Va. 22161, at PB-243 506, $3.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 45 p, 7 tab, 1 fig, 3 ref, append. OWRT A-039-CONN(1). 14-31-0001-3807.

Descriptors: *Sewage lagoons, *Domestic wastes, *Soil treatment, Waste disposal, Groundwater recharge, Temperature, *Waste water treatment, Cities, Urbanization, Biochemical oxygen demand, Sludge, Septic tanks, Water reuse.
Identifiers: *Lagoon-soil system, *Lagoon treatment, Small community system, Soil clogging, Sub-surface disposal, Decreased biological oxygen demand, BOD5.

A transparent-covered 4,600 gallon facultative lagoon was tested over two years using raw domestic sewage. The effluent was disposed of by use of subsurface seepage beds. The covered lagoon caused no nuisance or odors and was located 125 feet from the nearest residence. The lagoon pretreatment caused less soil clogging than septic tank effluent due to greater BOD5 removal. The lagoon-soil system, however, did not remove more nitrogen or phosphate than the septic tank-soil system. The removal of BOD5 was measured to be temperature dependent in the lagoon. The experiment will be continued to measure the long term effects of sludge accumulation. (See also W73-06742) (deLara-Connecticut)
W75-09524

MUNICIPAL SLUDGE MANAGEMENT, PROCEEDINGS OF THE NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT.
Held June 11-13, 1974 at Pittsburgh, Pennsylvania, The Pittsburgh Section of the American Society of Civil Engineers and the U.S. Environmental Protection Agency. Published 1974, Information Transfer, Inc., Washington, D.C., 218 p.

Descriptors: *Waste water treatment, Conferences, *Reviews, *Sludge disposal, *Sludge treatment, *Treatment facilities, Incineration, Filtration, Dewatering, Thickening, Digestion, Legislation, Regulations, Water quality control, Tertiary treatment.
Identifiers: *Composting, Sludge management, Conferences, State-of-the-art reviews.

Twenty-seven papers as well as the keynote and closing addresses are presented. Engineers, environmentalists, consultants, and municipal and federal administrators were participants. Several papers dealt with specific unit analyses of the methods of sludge handling and disposal. These included: sludge thickening, sludge dewatering, incineration, heat treatment, pressure filtration, composting, ocean disposal, trench incorporation, and pasteurization of liquid digested sludge. Treatment facilities at individual cities were described, detailing those at Chicago (Ill.), Denver (Colo.), Speedway (Ind.), Blue Plains (Washington, D.C.), Cedar Rapids (Iowa), Ontario (Canada), Philadelphia (Pa.), Pensacola (Fla.), St. Louis (Mo.), and Twin Cities (Minn.). The economics of sludge, as a profitable by-product of waste water treatment, are illustrated by its market value as a fertilizer, by experiments with sludge irrigation of agricultural crops, and by its value in the reclamation of soils lacking organic nutrients. The effects of public relations, federal legislation, and water quality standards on sludge management are also examined. (See W75-09533 thru W75-09558) (Prague-FIRL)
W75-09532

OVERVIEW OF SLUDGE HANDLING AND DISPOSAL,
National Environmental Research Center, Cincinnati, Ohio.
J. B. Farrell.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 5-10, 1974. 3 fig, 3 tab, 10 ref.

Descriptors: *Sludge treatment, *Sludge disposal, Reviews, Municipal wastes, Dewatering, Filtration, Sewage sludge, Toxicity, Landfill, Tertiary treatment, *Waste water treatment.
Identifiers: Land application, Co-pyrolysis, Co-incineration.

A review is given of both the treatment and the disposal operations now used for municipal waste water treatment of sludge. Trends from 1972 to 1985 are outlined; it is predicted that the amount of secondary treatment sludge will be almost doubled, and chemical sludges will be produced in quantity. It is also predicted that dewatering costs will increase as more municipalities upgrade facilities to improve effluent quality because biological secondary sludges and some types of chemical sludges are difficult to dewater. Treatment operations have been classified as thickening, stabilization, dewatering, and conditioning. Disposal operations include knowledge of hazards or toxicity, and use of land application, landfill, or incineration. Trends in disposal are difficult to forecast. Ocean disposal appears negative. Land application must be subject to many guidelines; landfill sites are diminishing; incineration faces the problem of the high cost of fuel and air pollution control equipment. New methods of disposal being investigated are co-incineration and co-pyrolysis of sludge with solid wastes. (See also W75-09532) (Prague-FIRL)
W75-09533

ALTERNATIVE METHODS FOR SLUDGE MANAGEMENT,
Environmental Quality Systems, Inc., Rockville, Md.
H. Bernard.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 11-20, 1974. 4 fig, 4 tab, 6 ref.

Descriptors: *Environmental effects, *Sludge disposal, *Sludge treatment, *Waste water treatment, Costs, Computer models, Sewage treatment, Management.
Identifiers: Disposal alternatives.

The holistic environmental viewpoint is considered in alternatives for sludge handling and disposal from waste water treatment plants. Computer methods can be used to consider economic alternatives, such as costs of power, chemicals, or transportation, coupled with emissions standards and availability of land. The sludge processing system involves both treatment of a liquid phase and treatment of a solid phase. While separated solids from sewage treatment is about 0.5 percent of the total liquid phase volume, sludge disposal has the disproportionate cost of about 30 to 50 percent of the total costs associated with waste treatment. Sludge disposal itself is often considered only after final stages of plant design are complete. Suggested for the determination of sludge management alternatives is a consideration of socio-economic-environmental factors. These are: energy, air pollution, land use, resource recovery, public attitudes, secondary impacts, surface water quality, nitrogen impact, soil pollution, cropping practices, economic impact, social requirements, and ecological impacts. Disposal alternatives of incineration, land disposal, recovery and sale, and composting are described. (See also W75-09532) (Prague-FIRL)
W75-09534

THICKENING OF SLUDGES,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 21-28, 1974. 5 fig, 13 ref. OWRT A-025-DEL(1).

Descriptors: *Sludge treatment, *Sludge disposal, Mathematical models, Costs, Settling, Waste disposal, Waste water treatment.
Identifiers: *Cost effectiveness, Thickening, *Sludge thickening.

While thickening is involved in any system of sludge treatment and disposal, rational approaches to the design and operation of thickeners for an optimal degree of thickening have not been traditionally implemented. This optimal degree of thickening has a significant effect on the total cost of sludge treatment and disposal, because cost effectiveness is dependent upon the concentration of solids in the sludge. Traditionally, thickeners have been sized arbitrarily without regard to the thickening properties of the sludge being treated. However, the size of a thickener does affect the amount of thickening achieved. Size can be computed or estimated if the settling characteristics of the sludge are known. The degree of concentration of sludge depends upon nature of the sludge, size of the community, and types of other sludge treatment and disposal involved in the same system. Rational analyses to determine potential cost reductions are illustrated. These integrate the design of the thickeners with the design of other processes. (See also W75-09532) (Prague-FIRL)
W75-09535

ANAEROBIC DIGESTER OPERATION AT THE METROPOLITAN SANITARY DISTRICTS OF GREATER CHICAGO,
Metropolitan Sanitary District of Greater Chicago, Ill.
S. P. Graef.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 29-35, 1974. 9 tab.

Descriptors: *Anaerobic digestion, *Sludge treatment, *Municipal wastes, Construction costs, Digestion, Operating costs, Sludge disposal, *Illinois, Waste water treatment.
Identifiers: *Chicago(Ill), Thickening, *Sludge thickening.

Anaerobic sludge digestion as utilized by the Metropolitan Sanitary District of Greater Chicago is summarized. The capacities of five digestion facilities are compared. Discussed also are digester construction costs, operation and maintenance costs, sludge conditioning and digester flow regimes, heat transfer, loading intensity, gas production, digested sludge characteristics, sludge disposal, and digester problems. Problems, such as thickening, clogging, foaming, gas recirculation, and supernatant separation have been solved. Bench and pilot scale research indicates that future improvements are possible. These include: shorter residence times, resulting from more homogeneous feed sludges, improved flow regimes and more frequent sludge analysis; uniform digester feeding and withdrawal accomplished by automatic mass balance control; on-line measurement of process stability indicators such as the rate of methane production; and, digester gas scrubbing in order to produce a cleaner fuel of higher BTU value, to reduce gas recirculation compressor fouling, and to provide pH control by removing the weak carbonic acid, rather than adding a base. As a means for sludge processing, anaerobic digestion should continue to be a viable method for the treatment of municipal sludges. (See also W75-09532) (Prague-FIRL)
W75-09536

METRO DENVER'S EXPERIENCE WITH LARGE SCALE AEROBIC DIGESTION OF WASTE ACTIVATED SLUDGE,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Col.
D. B. Cohen.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 37-53, 1974. 7 fig, 5 tab, 11 ref.

Descriptors: *Aerobic treatment, Aeration, Digestion, Pilot plants, Oxygen, Biological treatment, *Waste water treatment, *Activated sludge, Colorado.
Identifiers: *Denver(Colo), Aerobic digestion, Rotary diffusers, Waste activated sludge.

In 1970, the Metropolitan Denver Sewage District No. 1 (Metro) converted excess secondary aerators to aerobic digestors in two steps. The first part involved plant scale aerobic digestion of dilute W.A.S. in four converted secondary aeration basins. The second part involved extensive research and development to compare pilot open tank oxygen systems using both slot and rotating diffusers with this plant scale system. V.S.S. reductions ranged between 11.2% and 47.2% for the air system. A correlation between V.S.S. reduction and S.R.T. x temperature was shown to be significant. When invertebrates (especially rotifers) comprised a significant fraction of the biomass, digestion was maximum. No correlation between dissolved oxygen concentration and V.S.S. digestion rates was observed. At loadings greater than 0.14 pounds V.S.S. per cu ft per day, oxygen performance is superior. Aerobic digestion reduced sludge disposal costs. The Denver Sewage Disposal District (Metro) is now planning to convert a one million gallon tank to an oxygen aerobic digester with rotary diffusers. (See also W75-09532) (Prague-FIRL)
W75-09537

HIGH PURITY OXYGEN AEROBIC DIGESTION EXPERIENCES AT SPEEDWAY, INDIANA,
Union Carbide Corp., Tonawanda, N.Y. Linde Div.
D. W. Gay, R. F. Drnevich, E. J. Breider, and K. W. Young.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 55-66, 1974. 6 fig, 7 tab, 8 ref.

Descriptors: *Aerobic treatment, *Oxygen, *Waste water treatment, Microorganisms, Treatment facilities, Clarification, Costs, *Indiana.
Identifiers: Speedway(Ind), UNOX, *Aerobic digestion, High purity oxygen.

Aerobic digestion stabilizes primary waste and/or waste activated sludge through the catabolism of aerobic microorganisms. At the Speedway Indiana Water Pollution Control Plant, a full scale aerobic digestion study was performed, using high purity oxygen. The goal was to examine the possibility of attaining and operating at elevated temperatures without an external heat source. The facility's existing UNOX system was modified; the entire waste water flow from its primary clarifier was handled by one of two reactor trains while the other train served as an aerobic digestion unit. During winter operation, the oxygen aerobic digestion was capable of sustaining high (greater than 31C) temperatures by the conservation of energy produced by endogenous decay. Data obtained were used to design a full scale aerobic digestion system for Speedway, Indiana. The annual cost for digestion of waste sludge is $53,400, or the equivalent of $34.00 per ton of dry solids treated. (See also W75-09532) (Prague-FIRL)
W75-09538

SLUDGE DEWATERING,
Los Angeles County Sanitation Districts, Whittier, Calif.
C. W. Carry, R. P. Miele, and J. F. Stahl.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 67-76, 1974. 5 fig, 2 tab.

Descriptors: *Dewatering, *Sludge treatment, *Suspended solids, Centrifuges, Sanitary landfills, Sludge disposal, Pilot plants, Conditioning, Costs, California, *Waste water treatment.
Identifiers: *Los Angeles(Calif), Waste discharge, Sludge dewatering.

Since April 1970 a sludge dewatering investigation was performed by the Los Angeles County Sanitation District and their 380 mgd Joint Water Pollution Control Plant. The Los Angeles Regional Water Quality Control Board had set new discharge requirements that a minimum of 95 percent of the suspended solids in digested sludge be removed. Pilot plant studies showed that five conditioning-dewatering systems were capable of meeting these discharge requirements. An economic evaluation of each alternative was made, assuming a solids quantity of 390 tons per day. The result was the selection of a two stage centrifugation system. The system uses existing horizontal scroll centrifuges followed by imperforate bowl basket centrifuges. In addition, cationic polymers in the dosages of 4 lb/ton were added to the influent of the second stage unit. The composite cake from both units will be hauled by truck to a sanitary landfill. Costs of the total system are predeicted to be $36.40 per ton. (See also W75-09532) (Prague-FIRL)
W75-09539

PRESSURE FILTRATION--MUNICIPAL WASTEWATER SOLIDS, CEDAR RAPIDS, IOWA,
Green (Howard R.) Co., Cedar Rapids, Iowa.
J. W. Gerlich.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 77-85, 1974. 5 fig, 1 tab.

Descriptors: *Filtration, *Dewatering, *Sludge treatment, Conditioning, Costs, Fly ash, Filtrate, Iowa, Waste water treatment.
Identifiers: Pressure filtration, Cedar Rapids(Iowa), Filter cakes.

Cedar Rapids, Iowa has the first major installation in the United States using the pressure filter for its dewatering process. In pilot dewatering studies fly ash was effective in reducing chemical conditioning costs from twenty to four dollars per ton of dry solids. A nine month study evaluated full scale plant performance where sludge cake incinerator ash was utilized as a conditioning agent. Economic evaluation found that the process offered a distinct advantage over other forms of sludge dewatering for Cedar Rapids' sludge. Cake quality on the full scale plant was maintained over a broader range of solids concentrations than was expected. The product of pressure filtration is an increase in solids concentration in the cake with a decrease in suspended solids content in the filtrate. Advantages of pressure filtration include: quantities of sludge conditioners are usually reduced; filtration efficiency is maintained for a broad range of sludge characteristics; solids content of the filter cake is increased; filtrate suspended solids and BOD are very low; operation and manpower requirements are minimal; and cake disposal is convenient due to lower moisture and smaller volumes. (See also W75-09532) (Prague-FIRL)
W75-09540

HEAT TREATMENT AND INCINERATION,
Dorr-Oliver, Inc., Stamford, Conn.
D. T. Mayrose.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 87-91, 1974. 4 fig, 3 tab, 1 append.

Descriptors: *Heat treatment, *Incineration, *Dewatering, Sludge treatment, Biological treatment, Waste treatment, *Waste water treatment.
Identifiers: Sludge cakes.

Heat treatment, in combination with dewatering, is one alternative for treatment of municipal sludge. Waste sludges are heated to 400 F, and this temperature is maintained for about thirty minutes. A sludge is produced with greatly improved dewaterability characteristics. Illustrations compare dewatering heat treated sludge and chemically conditioned sludge. Advantages of heat treatment over raw chemically conditioned sludge include: twice the cake solids concentration in the dewatering unit is possible with heat treatment, as well as double the cake solids capacity of the dewater device; significant reduction or elimination of chemical condition agents can be achieved; when combined with combustion, a smaller incinerator can be used due to lower feed cake water content; and, no fuel will normally be needed for incineration due to the ratio of volatile matter to water in the dewatered heat treated sludge. The process of incineration of biological sludges is also discussed. This may be used alone or in combination with heat treatment. When used together, heat treatment and incineration improve the economics of sludge disposal by improving dewaterability as well as reducing or eliminating chemical conditioning agents and the need for auxiliary fuel. (See also W75-09532) (Prague-FIRL)
W75-09541

DRYING OF SLUDGE FOR MARKETING AS FERTILIZER,
Houston Sewage and Sludge Disposal Plant. Tex.
For primary bibliographic entry see Field 5E.
W75-09542

GROWTH OF BARLEY IRRIGATED WITH WASTEWATER SLUDGE CONTAINING PHOSPHATE PRECIPITANTS,
National Environmental Research Center, Cincinnati, Ohio.
M. B. Kirkham, and G. K. Dotson.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 97-106, 1974. 9 tab, 16 ref.

Descriptors: *Irrigation, *Sludge, *Phosphates, *Fertilizers, Agriculture, Barley, Lime, Alum, *Sludge treatment, *Waste water treatment, Water reuse.
Identifiers: Ferric chloride.

It has been unclear as to whether wet sludges containing precipitated phosphates can be used agriculturally. To jnvestigate the use of chemically-treated sludges, barley was grown for 16 weeks in pots of loam soil, and was then irrigated for 7 weeks with wet sludges. Raw primary sludge and primary sludges from alum and ferric chloride addition to raw waste water, either limed or unlimed, were added at two different rates. The rates corresponded to a total application of 23 or 46 m tons/ha/yr. The total and extractable phosphorus in the soil and the elemental composition of the plants were determined. Barley plants irrigated with three types of sludges grew as well as those supplied with inorganic fertilizer. However, fertilized plants yielded more grain than sludge-treated plants. Liming significantly decreased extractable phosphorus only in the iron-treated soil. Ninety-two percent of the phosphorus added by the sludges remained in the sludge crust throughout the experiment. On a short-term basis, for growing barley, it was shown that the presence of phosphate precipitated by Al or Fe did not limit growth and that sludges containing phosphate precipitants may be used. (See also W75-09532) (Prague-FIRL)
W75-09543

UTILIZATION OF DIGESTED CHEMICAL SEWAGE SLUDGES ON AGRICULTURAL LANDS IN ONTARIO,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 3F.
W75-09544

THE ECONOMICS OF SLUDGE IRRIGATION,
Springfield Sanitary District, Ill.
A. P. Troemper.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 115-121, 1974. 5 tab.

Descriptors: *Sludge disposal, *Sewage treatment, *Irrigation, Liquid wastes, Drainage, Planning, Design criteria, Anaerobic digestion, Waste water treatment, *Costs, Illinois, Water reuse.
Identifiers: Waste discharge, Spray irrigation, Springfield(Ill).

Discharge of liquid anaerobically digested sludge to an experimental plot was begun in 1965 by the Springfield, Illinois Sanitary District. Irrigation continued through 1971, with crops being planted both on the sewage treated area and on a control area. Costs and benefits in terms of crop yield for each season are enumerated. It was concluded that irrigation on cropland with liquid digested sludge is a valid disposal method for municipal sludge. Spray irrigation was the most practical method of application, although wind drift must be taken into account. Given a sufficient amount of land, the method is economically competitive with alternative methods of disposal. The operation requires minimal attention and creates no odor nuisance, so long as the sludge is reasonably well digested. In designing a system for liquid sludge disposal, a permanent disposal area with a sloped distribution system will allow operation in severe winter months without additional problems; with provision of a good underdrainage system, the possibility of groundwater contamination is minimized. (See also W75-09532) (Prague-FIRL)
W75-09545

COMPOSTING SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
E. Epstein, and G. B. Willson.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 123-128, 1974. 3 fig, 1 tab, 5 ref.

Descriptors: *Sewage sludge, *Fertilizer, Sludge disposal, *Waste water treatment, Costs, Digestion, Public relations, Planning, Odors, District of Columbia.
Identifiers: *Composting, Blue Plains(Washington DC).

The composting of sewage sludge was investigated at a pilot plant at the Blue Plains Wastewater treatment plant in Washington, D.C. Sewage sludge has seldom been composted by itself, and various types of bulking agents were tested in order to determine which materials and in what ratio to the sludge gave the desired density and moisture content. The optimal bulking agent was wood chips, incorporated with sludge at a ratio of 3:1. The operation of the composting site at Beltsville, Maryland is detailed. Two major operational problems were how to compost digested sludge under adverse weather conditions and how to compost raw sludge without odors. The addition of material such as chopped hay, straw, or shredded paper to digested sludge accelerates its composting. Further research is being done on odor prevention, using microbiological, chemical, and mechanical methods. Efficient management and coordination between the sewage treatment plant and the composting site is necessary. A public relations program is important. Direct cost-benefit relationships have not been computed; the composting of sewage sludge now has the goal of reducing sludge disposal costs from waste water treatment plants rather than being a profit-making venture. (See also W75-09532) (Prague-FIRL)
W75-09546

RECENT SANITARY DISTRICT HISTORY IN LAND RECLAMATION AND SLUDGE UTILIZATION,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5E.
W75-09547

SLUDGE MANAGEMENT IN ALLEGHENY COUNTY,
Allegheny County Dept. of Public Works, Pa.
For primary bibliographic entry see Field 5E.
W75-09548

TRENCH INCORPORATION OF SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
For primary bibliographic entry see Field 5E.
W75-09549

OCEAN DISPOSAL EXPERIENCES IN PHILADELPHIA,
Philadelphia Water Dept., Pa.
For primary bibliographic entry see Field 5E.
W75-09550

SLUDGE DISPOSAL BY INCINERATION AT ALCOSAN,
Allegheny County Sanitary Authority, Pittsburgh, Pa.
For primary bibliographic entry see Field 5E.
W75-09551

PASTEURIZATION OF LIQUID DIGESTED SLUDGE,
Cincinnati, Ohio National Environmental Research Center.
G. Stern.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 163-169, 1974. 1 fig, 4 tab, 7 ref.

Descriptors: *Sludge disposal, *Pathogens, *Pasteurization, Sludge treatment, Digestion, Viruses, Bacteria, Public health, Laboratory tests, Soils, *Waste water treatment.
Identifiers: *Land application, Liquid digested sludge.

Liquid digested sludge, when applied to land for final disposal, may contain pathogens such as viruses, bacteria, cysts or oocysts or protozoa and worm eggs. There is no evidence that stabilized sludges have caused disease to man or animals. However, concern of health officials that these pathogens be completely destroyed has led to laboratory investigations of pasteurization of liquid digested sludge as a method of disinfection. In West Germany, pasteurization is used when sludge is spread during the summer growth season. The National Environmental Research Center in Cincinnati, Ohio, tested pasteurization time/temperature relationships, types and amount of fuel sources and heat required, the transfer and dispersion of heat with liquid sludge, types of equipment, and estimated costs of the pasteurization methods. It was concluded that pasteurization at 70 C for 30 to 60 minutes destroys pathogens effectively. Methane gas from anaerobic digestion is available as a fuel source, with direct steam injection and efficient mixing of steam and liquid sludge recommended. The costs were about ten dollars per ton of sludge solids for small plants. Studies also showed that pasteurized sludge can be applied to growing lawn grasses as long as the sludge has been cooled to 60 C at the soil surface. (See also W75-09532) (Prague-FIRL)
W75-09552

SLUDGE HANDLING AND DISPOSAL AT BLUE PLAINS,
District of Columbia Dept. of Environmental Services, Washington.
A. F. Cassel, and R. T. Mohr.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 171-176, 1974. 3 fig, 3 tab.

Descriptors: *Sludge treatment, *Sludge disposal, Treatment facilities, Land use, Dehydration, Incineration, Guidelines, Fertilizer, Energy, Pilot plants, District of Columbia, *Waste water treatment.
Identifiers: *Composting, Blue Plains Treatment Plant(Washington DC), Land application, Thermal dehydration.

Problems of sludge handling and disposal at the Blue Plains Wastewater Treatment Plant in the Washington, D.C. area are described. The plant is currently being expanded with the addition of advanced waste water treatment. Both raw and digested sludge undergo disposal by a variety of techniques including land spreading, burial, composting,d thermal dehydration. New alternatives, including the processing of sludge into a reusable commodity, are being studied. A multi-faceted disposal method that is not totally subject to weather or to biological and chemical upsets is described. Options to consider for future sludge disposal are: all raw sludge disposal, thermally dehydrated, marketed as fertilizer; a combination of raw sludge which is thermally dehydrated for fertilizer and digested sludge disposal of on land or composted, wherby methane from the digestion is used as fuel for drying; a combination of raw sludge which is incinerated with digested sludge disposed of on land or composted; and the incineration of completely raw sludge. These options will be tested by an EPA-D.C. pilot plant, taking into account factors of energy availability as well as specific problems of each alternative method. (See also W75-09532) (Prague-FIRL)
W75-09553

AGRICULTURAL UTILIZATION OF DIGESTED SLUDGES FROM THE CITY OF PENSACOLA,
Baseline, Inc., Pensacola, Fla.
For primary bibliographic entry see Field 5E.
W75-09554

INSTITUTIONAL PROBLEMS ASSOCIATED WITH SLUDGE DISPOSAL,
Washington Suburban Sanitary Commission, Hyattsville, Md.
For primary bibliographic entry see Field 5E.
W75-09555

ENERGY CONSERVATION AND RECYCLING PROGRAM OF THE METROPOLITAN SEWER BOARD OF THE TWIN CITIES AREA,
Metropolitan Sewer Board, St. Paul, Minn.
D. C. Bergstedt.
In: Municipal Sludge Management, Proceedings of the National Conference on Muncipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 187-194, 1974. 8 fig.

Descriptors: *Energy *Sewage treatment, *Sludge treatment, Sludge disposal, *Recycling, Conservation, Treatment facilities, Incineration, Equipment, Operation, Fertilizers, Water reuse, Minnesota, *Waste water treatment.
Identifiers: Sludge recycling, St. Paul(Minn), Minneapolis(Minn).

Recent actions of the Metropolitan Sewer Board of the Twin Cities Area in response to the 1973 energy problems are described. The Board is the regional treatment authority for waste water in the area of Minneapolis and St. Paul, Minnesota and operates 24 treatment plants. Ten major programs have been instituted related to energy saving and recycle, without detriment to the quality of waste water treatment. Major changes include: pyrolysis of municipal refuse to furnish heat value for sludge drying; recovery and beneficial use of heat in exhaust gases from incinerators; continuous pressure dewatering; flameless odor control; and improved results by the modification of existing sludge processing equipment. Additionally, the operations include manufacture of fuel-grade sludge cake and char; preparation of fertilizer, soil conditioner and recyclable metal scrap; use of solid fossil fuel, such as coal, to augment combustion in incinerator furnaces; manufacture of activated carbon for in-plant use; and pulping of refuse fibers for use as filter aid. The important factor in choice of these alternatives for energy conservation and recovery is the reliability of a chosen method. (See also W75-09532) (Prague-FIRL)
W75-09556

SLUDGE DISPOSAL AT A PROFIT,
Barber-Colman Co., Irvine, Calif. Resource Recovery Systems Div.
W. M. Fassell.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 195-204, 1974. 7 fig, 6 tab, 16 ref.

Descriptors: *Oxidation, *Sludge disposal, *Sludge treatment, Costs, Energy, Thermal energy, Organic compounds, Recycling, Waste water treatment.
Identifiers: *Wet oxidation system, PURETEC/WETOX System.

The application of hydrometallurgical wet oxidation practice to the destruction of sewage sludge has been investigated. The PURETEC/WETOX Process uses an agitated horizontal, multiple-compartment autoclave. The reactor operates under mildly acid conditions and achieves 75 to 85 percent destruction of the COD in any sewage sludge at 440 to 465 F and 600 psi. Substantial quantities of thermal energy are generated; nitrogen compounds are converted to ammonia which is recoverable. Metals, which now are in short supply, are extractable. The predominant organic compound in the resultant solution is acetic acid, which may be used as a carbon source for denitrification. Economic evaluations of the PURETEC/WETOX system are given, in theory, for Philadelphia and for the Blue Plains Wastewater Treatment Facility (Washington, D.C.). With credits for reusable materials as by-products of the system from the traditional sludge disposal costs of $25 to $47/ton may be reduced to between $10/ton and a theoretical net operating costs. Within the next calendar year, pilot plants for large scale demonstration of the wet oxidation system will be in operation. (See also W75-09532) (Prague-FIRL)
W75-09557

SLUDGE MANAGEMENT SYSTEM FOR ST. LOUIS,
Saint Louis Metropolitan Sewer District, Mo.
P. F. Mattei.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 205-210, 1974.

Descriptors: *Sludge treatment, Watersheds(Basins), *Anaerobic digestion, Incineration, Tertiary treatment, Vacuum filtration, Storage, Treatment facilities, *Waste water treatment.
Identifiers: *Land requirements, Solids handling, St. Louis(Mo).

Two types of solids handling systems of the Metropolitan St. Louis Sewer District, each for a major subdistrict, are described. The two systems are based on the individual needs to their watersheds. Anaerobic digestion with storage basins was chosen for a secondary treatment plant at Coldwater Creek. The plant services an area of 41 square miles, with a design average flow of 25 mgd. The two Mississippi River subdistrict plants--Lemay and Bissell Point--provide primary treatment for an average design flow of 424 mgd and serve a watershed of 196 square miles. Vacuum filtration, incineration and ash storage basins were selected for these larger subdistrict plants. Because of the disposal methods chosen for Lemay and Bissell point, the land requirement was significantly reduced. The smaller plant at Coldwater Creek, on the other hand, had adequate land for storing digested sludge, and methane gas from the digestion process provided energy to drive blowers and pumps at an economic cost for the secondary treatment process. Each system is well-adapted to its individual watershed location. (See also W75-09532) (Prague-FIRL)
W75-09558

DESIGN CRITERIA FOR MECHANICAL, ELECTRIC, AND FLUID SYSTEM AND COMPONENT RELIABILITY, SUPPLEMENT TO FEDERAL GUIDELINES FOR DESIGN, OPERATION, AND MAINTENANCE OF WASTE WATER TREATMENT FACILITIES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 8C.
W75-09559

PHOSPHORUS REMOVAL STUDY AT THE SARNIA WPCP,
Ontario Ministry of the Environment, Toronto.
I. M. Gray.
Environment Canada, Centre for Inland Waters, Burlington, Ontario. Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No 14, (1974). 20 p, 7 fig, 3 tab, 71-2-1.

Descriptors: *Sludge treatment, *Treatment facilities, *Waste water treatment, Jar tests, Hydraulics, Phosphorus, *Canada.
Identifiers: *Sarnia Water Pollution Control Plant(Ont), *Phosphorus removal, *Ferric chloride.

A research project was conducted at the Sarnia Water Pollution Control Plant from January to June, 1972 to investigate: the effects of ferric chloride dosage, mixing, and hydraulics on the removal of total phosphorus in a primary waste water treatment plant; and, the effects of ferric chloride addition for phosphorus removal on the anaerobic sludge digestion process. The investigation followed a jar test study and a temporary full scale phosphorus study using ferric chloride, which had been conducted previously by the Dow Chemical Company of Canada, Limited. Existing facilities at the Sarnia WPCP are described, and the average process and analytical data obtained are presented. Effects of various dosages of ferric chloride, with and without the addition of polymers, under various mixing and primary clarifier hydraulic conditions are discussed, in terms of phosphorus removal and other effluent quality parameters. Similarly, the effects of the chemical addition on sludge production and anaerobic sludge digestion are presented. (Prague-FIRL)
W75-09562

PHOSPHORUS REMOVAL IN SEASONAL RETENTION LAGOONS BY BATCH CHEMICAL PRECIPITATION,
Ontario Ministry of the Environment, Toronto.
H. J. Graham, and R. B. Hunsinger.
Environment Canada, Centre for Inland Waters, Burlington, Ontario. Canada-Ontario Agreement Research Report No 13, (1974). 40 p, 15 fig, 4 tab, 14 ref. 73-1-13.

Descriptors: *Phosphorus, *Nutrient removal, *Waste water treatment, *Precipitation(Chemical), *Water pollution treatment, Chemicals, Sewage treatment, Municipal wastes, Industrial wastes, Coagulation, Lagoons, Lime, *Canada.
Identifiers: *Batch treatment, Alum, Ferric chloride, Ontario, Phosphorus removal.

A result of a Province of Ontario policy requiring phosphorus removal at municipal and institutional waste water treatment facilities in certain areas of the province is the development of a method of reducing the total phosphorus content in waste stabilization pond effluents to below 1.0 mg/liter. The method of achieving this in seasonal retention lagoons is through batch chemical treatment of the pond contents prior to discharge. Three prime coagulants, alum, ferric chloride, and lime were field tested. The required chemical dosage was determined by jar tests using lagoon contents. Batch chemical treatment of seasonal retention lagoons can produce total phosphorus residuals of less than 1.0 mg/liter. The quality of the effluent from a batch treated lagoon is at least as good as that achieved through conventional secondary treatment. Batch treatment can effectively remove algae from the pond contents if the chemical dosage is sufficient. Liquid alum and ferric chloride both produced a high quality effluent. Inconsistent results were obtained from the lime applications. Good dispersal of the chemical and adequate mixing with the pond contents can be accomplished with an outboard motorboat method of application. Batch chemical treatment is feasible on many existing lagoons that have an adequate retention time for winter storage. Some single and large cells can also be batch treated but lagoons built specifically for batch treatment ensure ease of operation. In five successive treatments of one lagoon, the dosage required for adequate phosphorus removal did not increase and there was only a slight increase in the sediment depth with each treatment. (Orr-FIRL)
W75-09563

IDENTIFICATION OF PROBLEM AREAS IN WATER POLLUTION CONTROL PLANTS,
Ontario Ministry of the Environment, Toronto.
K. M. Azan, and B. I. Boyko.
Environment Canada, Centre for Inland Waters, Burlington, Ontario, Canada-Ontario Agreement on Great Lake Water Quality, Research Report No 15, (1974). 41 p, 12 fig, 5 tab, append. 73-1-27.

Descriptors: *Water pollution control, *Treatment facilities, *Canada, Flow measurement, Surveys, Design criteria, Personnel, *Waste water treatment.
Identifiers: *Ontario(Canada), Hydraulic overloading.

Problem areas commonly encountered in waste water treatment facilities were determined from responses of Water Pollution Control Plant operators to a questionnaire circulated to 162 WPCP's in Ontario. Overall responses indicated that the major problem area in WPCP operation is hydraulic overloading. The incidence of hydraulic overloading is independent of plant size; a significant percentage of plants constructed in the last five years are overloaded. Hydraulic overloading affects pumping capacity, grit removal and secondary clarifier operation. Responses also indicated a general need for additional flow measurement devices. In addition, a considerable need for further operator education in plant testing procedures, interpretation and application of laboratory results, waste water treatment processes, safety, and equipment repair. (Prague-FIRL)
W75-09564

WET AIR OXIDATION OF CHEMICAL SLUDGES,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
R. R. Hudgins, and P. L. Silveston.
Environment Canada, Centre for Inland Waters, Burlington, Ontario. Canada-Ontario Agreement Research Report No 12, March, 1973. 79 p, 7 fig, 6 tab, 23 ref, 5 append.

Descriptors: *Waste disposal, *Sludge disposal, *Oxidation, Phosphorus, Chemical reactions, *Waste water treatment, Sewage treatment, Municipal wastes, Canada, Foreign research, *Sludge treatment.
Identifiers: *Wet air oxidation.

The Zimmerman process, also called Wet Air Oxidation, or wet oxidation was developed over 20 years ago as a technique for waste disposal. Wet air oxidation was performed on eight Ontario sludges containing phosphorus. Some of the sludges were obtained from primary or secondary clarifiers in which lime, ferric chloride, or alum had been added to precipitate phosphorus. The sludges were oxidized at temperatures up to 550 F in a rocking autoclave; total carbon and total organic carbon values were measured in samples taken during oxidation. Selected total phosphorus and ortho-phosphorus analyses were made on both chemical and non-chemical sludges. For most sludges at 500 F, a reduction of at least 50% of the TOC was produced by 3 hours exposure to wet air oxidation. Mass transfer limitations seemed to be present except in the case of the activated sludges. Cations from chemical stabilization of phosphorus seem to catalyze wet air oxidation. The stabilization of phosphorus by prior chemical treatment was slightly reversed by wet air oxidation of the chemical sludges. Contradictory evidence of increased and reduced stabilization resulting from wet air oxidation of non-chemical sludges illustrates the need for further studies. Sludges containing high levels of chemicals may cause carbonate formation during sludge oxidation. Recovery of a high yield phosphorus in the form of a residual ash from wet oxidation appears feasible. Further studies are needed to establish the kinetics of wet air oxidation more fully and to provide knowledge of the reasons for changes in solubility during the process. (Orr-FIRL)
W75-09565

PROCESS FOR THE REDUCTION OF THE BIOCHEMICAL OXYGEN DEMAND OF SEWAGE AND FOR THE RECOVERY OF THE INHERENT PROTEIN,
J. Hollo, J. Toth, and I. Zagyvai.
Canadian Patent 959,586. Patent Office Record, Vol 102, No 51, p 83, December, 1974.

Descriptors: *Sewage treatment, *Patents, *Biochemical oxygen demand, *Proteins, Polymers, Hydrogen ion concentration, Dewatering, Alum, Iron, Chemical precipitation, *Waste water treatment.
Identifiers: Copolymers, Dehydration, Protein recovery.

A process for the reduction of BOD of sewage is described in which the inherent protein is recovered. Sewage is purified by adding to it at least 120 g/cu m of a water-soluble aluminum salt or a bivalent or trivalent iron salt, and possibly 0.5 to 1.0 kg/cu m of bentonite or kaolin, as well as five to ten g/cu m of copolymers of acrylic acid - acrylic amide in the form of an aqueous solution. Sewage is then conditioned, its pH is adjusted to exceed ten by adding a basic calcium compounds, and the protein-containing precipitate thus obtained is separated from the clarified water in a settling tank. The pH of the precipitate is adjusted to seven or less using carbon dioxide. After dehydration the precipitatate may be sterilized at temperatures above 130 C under pressure. (Prague-FIRL)
W75-09566

WASTEWATER TREATMENT SYSTEM,
F. A. Karr.
Canadian Patent 959,182, Issued December 10, 1974. Patent Office Record, Vol 102, No 50, p 74, December, 1974.

Descriptors: *Patents, *Waste water treatment, *Oxygen, Sumps, *Biological treatment, Bacteria.
Identifiers: Oxygen injection, Bacterial treatment.

An apparatus and method are described for injecting air or other oxygen-containing gases under pressure into waste water from within a gas porous shell capable of passing gas bubbles of a size for retention by the waste water. The injection may be through elements at the bottom of a sump or on stream in a recycle line to and from the sump. A bed of perforate balls on the bottom of the sump provides an excellent surface area for bacterial treatment by coated enzymes injected into the system. (Prague-FIRL)
W75-09567

WASTEWATER TREATMENT SEQUENCE,
M. Zuckerman, and A. Molof.
Canadian Patent 957,789. Issued November 12, 1974. Patent Office Record, Vol 102, No 46, p 74, November, 1974.

Descriptors: *Patents, *Waste water treatment, *Pre-treatment, *Hydrolysis, Biological treatment, Organic matter, Filtration, Membranes, Disinfection.

An improved process for treating waste water is based on pretreatment by hydrolysis. This converts high molecular weight soluble organic material in raw waste water into organic material of low molecular weight. Following this conversion, the waste water is treated with a process sequence tailored to effluent quality requirements. One such sequence may include, for example, the steps of physical or biological adsorption, solids removal, membrane filtration, and disinfection. (Prague-FIRL)
W75-09569

SEWAGE TREATMENT WITH PRIMARY SLUDGE REMOVAL FROM FINAL CLARIFIER,
J. D. Walker.
Canadian Patent 959,584. Issued December 17, 1974. Patent Office Record, Vol 102, No 51, p 83, December, 1974.

Descriptors: *Sewage treatment, *Sludge treatment, *Patents, Settling basins, Tanks, Aeration, Clarification, Sludge disposal, *Waste water treatment.
Identifiers: Settling tanks, Clarification tanks.

A method of sewage treatment with primary sludge removal from a final clarifier is described. The primary settling tank is omitted or reduced in size; the primary type of sludge is carried through the aeration tank by vigorous circulation of its contents, then removed from the system at the final clarification tank. Sludge settles on the floor near the entry to the clarifying area and is scraped separately into a hopper as waste sludge. All sludge settling further remote from the feed is removed from several points for rapid return of a portion to the aeration tank. The reduction of primary settling provides an inventory of fine inert particles. In the aeration tank, these particles adhere to the light activated sludge flocs to increase their weight and aid settling in the clarification tank. (Prague-FIRL)
W75-09570

WET OXIDATION TREATMENT OF WASTE LIQUOR OR SLUDGE,
L. A. Pradt.
Canadian Patent 958,507. Issued December 3, 1974. Patent Office Record, Vol 102, No 49, p 2, December, 1974.

Descriptors: *Patents, *Waste water treatment, Oxidation, Waste treatment, *Sewage treatment, Tanks, Sludge treatment, Industrial wastes, *Oxidation.
Identifiers: *Wet oxidation, Flash tanks.

Wet oxidation treatment of waste liquor or sludge is described. Raw liquor or sludge derived from either sewage or industrial wastes is introduced to a heat exchanger. It then proceeds through a temperature control valve to a reactor, and to a separator. A flash tank receives oxidized liquor from the separator; another flash tank receives oxidized liquor from the separator at an intermediate pressure. This results in flash steam used for indirect preheating of the liquor or sludge by the heat exchanger in a single stage. (Prague-FIRL)
W75-09571

BIOLOGICAL AERATED FILTERS,
J. Tymoszczuk.
Canadian Patent 953,039. Issued August 13, 1974. Patent Office Record, Vol 102, No 33, p 85, August, 1974.

Descriptors: *Filters, *Patents, *Aeration, Domestic wastes, Industrial wastes, *Waste water treatment, Water pollution, Effluents.
Identifiers: *Biological aerated filters.

A process for the treatment of domestic and industrial wastes was a submerged biological filter bed of finely divided particulate filtering media. The wastes enter the biological filter bed and the filter is aerated during the filtration process. Treated effluent is drawn out of the biological filter bed; the bed is backwashed as often as necessary to maintain operating efficiency. The process is different from other processes because of the maintenance of a submerged and aerated filter bed. (Leibowitz-FIRL)
W75-09572

PROCESS FOR THE RECOVERY OF FORMALDEHYDE AND PHENOL CONTAINED IN WASTE WATERS,
J. Ackermann, G. Minore, and P. Radici.
Canadian Patent 963,592. Issued February 25, 1975. Patent Office Record, Vol 103, No 8, p 86, February, 1975.

Descriptors: *Patents, *Waste water treatment, *Phenols, Water reuse, Ammonia, Liquid wastes, *Recycling, Water purification, Industrial wastes.
Identifiers: *Formaldehyde, Waste liquors.

In a process for the purification of waste liquors, formaldehyde and phenol are recovered from the liquors. Ammonia is added to the formaldehyde liquor, to form hexamethylene tetramine. Water is evaporated and the concentrate is added to the phenol liquor, thus recovering the hexamethylene tetramine/phenol adduct formed. (Prague-FIRL)
W75-09573

PROJECTS IN THE INDUSTRIAL POLLUTION CONTROL DIVISION - DECEMBER 1974.
Environmental Protection Agency, Washington, D.C. Industrial Pollution Control Div.
Available from the National Technical Information Service, Springfield, Va. 22161. Report EPA-600/2-75-001, December 1975, 439 p. 1BB036 PEMP Task 003.

Descriptors: *Projects, *Waste water treatment, *Industrial water, *Research and development, *Water pollution control, Documentation.

A compilation is presented of information sheets from projects initiated since fiscal year 1967 through fiscal year 1974. Each sheet contains the objectives, statistical information, and a brief description of the project. General introductory information on the Federal Industrial Pollution Control Program is also presented to provide perspective on the magnitude of industrial pollution and the research directions that must be pursued in order to develop the technology to adequately control this largest point source of pollution in the United States. (EPA)
W75-09578

STORM WATER MANAGEMENT MODEL: USER'S MANUAL, VERSION II,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. C. Huber, J. P. Heaney, M. A. Medina, W. A. Peltz, and H. Sheikh.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-670/2-75-017, March 1975, 350 p, 42 fig, 90 tab. 1BB034; ROAP 21ATA; Task 022. R-802411.

Descriptors: *Water quality, Runoff, Storm sewers, *Sewers, *Urbanization, Stream pollution, Estuaries, *Mathematical models, Water storage, Water pollution, *Waste water treatment, Surface runoff, Soil erosion, Drainage, Cost analysis, Hydraulics, *Combined sewers, Model studies, Computer models, Overflow, Storm water.
Identifiers: *Urban runoff modeling, *Optimum design, Lancaster(Pa), St Johns River(Fla).

A comprehensive mathematical model (the EPA Storm Water Management Model, SWMM) capable of representing urban stormwater runoff and combined sewer overflow phenomena was developed. SWMM portrays correctional devices in the form of user-selected options for storage and/or treatment with associated estimates of cost. Effectiveness is portrayed by computed treatment efficiencies and modeled changes in receiving water quality. The original project report published in 1971 is divided into four volumes: Volume I, 'Final Report'; Volume II, 'Verification and Testing'; Volume III, 'User's Manual'; and Volume IV, 'Program Listing' (EPA Report Nos 11024DOC07/71, 11024DOC08/71 11024DOC09/71, and 11024DOC10/71, respectively). (See also W71-13370). Effort on modification and improvement of the SWMM has been, and is being continued since its release. As a result, this official 'Release 2' of the SWMM includes additional program components, i.e., new runoff routine, urban erosion prediction, new treatment process performance and cost functions, and new receiving water quality. This report provides a revised and improved User's Manual to accompany 'Release 2' as in the original User's Manual, Volume III. (EPA)
W75-09579

COUNTERMEASURES FOR POLLUTION FROM OVERFLOWS; THE STATE OF THE ART,
Environmental Protection Agency, Edison, New Jersey, Storm and Combined Sewer Section.
R. Field, and J. A. Lager.
Available from the National Technical Information Service, Springfield, Va. 22161. Report EPA-670/2-74-090, December 1974. 30 p, 4 fig, 2 tab, 28 ref. 1BB034/ROAP 21ASY/TASK 01. EPA Contract 68-03-0179.

Descriptors: Disinfection, *Waste treatment, *Sewage treatment, Sewage, Water quality, Cost effectiveness, Storage tanks, *Storm sewers, *Overflows, *Combined sewers, Mathematical models, Storm runoff, Drainage systems, Water pollution control, Pollution abatement, *Storm runoff, *Waste water treatment, *Urban hydrology.

Control and/or treatment of stormwater discharges and combined sewage overflows from urban areas are important problems in the field of water quality management. Over the past decade much research effort has been expended and a large amount of data has been generated. Presented are selected results of a comprehensive investigation and assessment of promising, completed and ongoing projects, representative of the state-of-the-art in abatement theory and technology; a look at recent legislation; and the identification of program needs and emphasis. Combined sewer overflows are major sources of water pollution problems, but even discharges of stormwater alone can seriously affect water quality. Current approaches involved control of overflows, treatment and combinations of the two. Control may involve maximizing treatment with existing facilities, control of infiltration and extraneous inflows, surface sanitation and management, as well as flow regulation and storage. A number of treatment methods have been evaluated including high rate screening and microstraining, ultra high rate filtration, dissolved air flotation, physical/chemical treatment, and modified biological processes. A swirl flow regulator/solids separator of annular shape construction with no moving parts has been developed. High rate disinfection methods including new disinfectants have been applied. Promising approaches involve integrated use of controls and treatment. (EPA)
W75-09580

STATE OF ARIZONA, ENVIRONMENTAL SERVICES NEEDS STUDY FOR GREENLEE COUNTY, 1970-1990.
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
June, 1974. 77 p, 32 tab, 10 fig, 11 plates, 40 ref.

Descriptors: *Arizona, *Water supply, *Sewage disposal, *Environmental sanitation, *Waste disposal, *Solid wastes, Environmental effects, History, Agriculture, Irrigation, Mining, Mine water, Livestock, Forecasting, Waste water treatment, Planning.
Identifiers: Greenlee County(Ariz).

Existing water systems and sewage and solid waste disposal facilities are identified and evaluated, and a projection is made of future needs for these facilities and services in rural areas of Greenlee County. Greenlee County will have only minor problems in maintaining environmental services over the next twenty years because little population growth is foreseen for the rest of the century. Problems that might occur can best be handled on the local level. The area's biota, geology and water supply are reviewed, brief historical sketches are given for the county's few communities. (Bowden-Arizona)
W75-09584

THE QUALITATIVE AND QUANTITATIVE DETERMINATION OF SOLUBLE AND INSOLUBLE FORMS OF PHOSPHORUS IN SEWAGE TREATMENT PLANTS,
Michigan State Univ., East Lansing. Inst. of Water Research.
F. M. D'Itri.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 514, $4.75 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 93 p, 13 fig, 23 tab, 58 ref, append. OWRT A-042-MICH(1), 14-31-0001-3222.

Descriptors: *Waste water treatment, Ion exchange, *Sewage treatment, Michigan, *Phosphorus compounds, *Phosphates, Detergents, Sewage effluents, Activated sludge.
Identifiers: East Lansing(Mich), *Biochemical hydrolysis, *Orthophosphates, Pyrophosphates, Tripolyphosphates.

The major source of phosphorus to surface waters in the United States is condensed phosphates in detergents which hydrolize to orthophosphate, the form most readily available to plants and organisms. While the chemical hydrolysis of these compounds occurs at a relatively slow rate, the biochemical hydrolysis which takes place in wastewater is much more rapid. In the East Lansing Sewage Treatment Plant, the total ortho

and condensed phosphate concentration was highly variable. The average yearly tripolyphosphate and pyrophosphate concentrations in filtered primary effluent of 2.44 and 0.44 mg/l respectively decreased to 0.74 and 0.19 mg/l after secondary activated sludge treatment. In the primary effluent the orthophosphate, pyrophosphate and tripolyphosphate concentrations represented 43.5, 6.6, and 37.1 percent of the total phosphorus concentrations of the wastewater. After activated sludge treatment, the relative yearly concentrations of orthosphate, pyrophosphate and tripolyphosphate were 76.9, 3.8, and 14.9 percent of the total phosphorus content. During the same time concentration of organic phosphorus containing compounds also decreased from 0.84 to 0.21 mg/l.
W75-09618

SOLAR STILL WITH REPLACEABLE SOLAR ABSORBING LINER AND WEIGHT CONTROLLED FEED INLET,
For primary bibliographic entry see Field 3A.
W75-09643

WATER TREATMENT PLANT,
B. C. Bradford.
US Patent No 3,881,700, 4 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 182, May 6, 1975.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, *Mixing, Aeration, Turbulence, Treatment facilities, *Water purification.
Identifiers: *Turbulent mixing, *Chemical treatment.

A water treatment plant is described which provides for the mixing of chemicals with water and subsequent aeration of the water for aiding in purifying the water. The device includes a vertical tank which contains a hood. The solution of raw water and chemicals enter the top of the tank into the hood and collide with a cup-shaped deflector. The cup-shaped deflector reverses the flow of water with great turbulence and forces the water and chemical solution up into a mixing chamber defined by the upper portion of the hood. The solution then flows down under the bottom of the hood upwards in the tank. Intermediate the top and bottom of the tank is a loc layer which aids in removing impurities from the solution. The solution is then aerated by passing through a launder and a collection well. Subsequent filtration can take place if desired. (Sinha-OEIS)
W75-09645

WATER TREATMENT APPARATUS,
Norwich (England). (assignee)
F. Smith.
US Patent No 3,881,704, 5 p, 5 fig, 5 ref; Official Gazette of the US Patent Office, Vol 934, No 1, p 183, May 6, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Coagulation, Mixing, Water quality control, Separation techniques, Chemical reactions, Equipment.

An apparatus is described which is of particular value for forming a complex alkali metal-aluminium-silicate material that is completely soluble in hydrochloric acid and that is of particular value as a coagulant or coagulant aid in the removal of solids from an aqueous suspension. The apparatus is comprised of a mixing chamber, at least three separate inlets for liquids to the chamber, an outlet duct at a position distant from the inlets, a hydraulic ejector to which the outlet duct leads, and means for mixing under high shear within the chamber material introduced through the inlets. (Sinha-OEIS)
W75-09646

METHOD AND APPARATUS FOR AERATION OF BIODEGRADABLE WASTE MATERIAL,
Vand (Ren), Inc., Webster City, Iowa. (assignee)
N. R. Wittrup.
US Patent No 3,882,017, 5 p, 8 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 281, May 6, 1975.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aeration, *Water pollution treatment, *Biodegradation, Oxygen, Equipment.
Identifiers: Pressure aeration, Turbulent mixing.

A method of pressure aeration of biodegradable waste material to enhance the rate of degradation by aerobic bacteria present in the waste material is disclosed. Under conditions of high velocity, a waste material slurry taken from a reservoir of biodegradable waste material is introduced into a confining zone to create a pressure greater than atmospheric, and to create high velocity turbulent flow. The aerated slurry is withdrawn from the confining zone and introduced into a mixing and separating zone. The mixing area and separating zone are separated by a back pressure means. Turbulent mixing occurs in the mixing area and the slurry is withdrawn from the separating area and discharged downstream from the back pressure creating means. Excess air and undissolved gases are separated. The aerated slurry is discharged under conditions of high velocity into a reservoir of waste material. (Sinha-OEIS)
W75-09647

PROCESS FOR EFFLUENT WATER RECOVERY,
Hill Brothers Chemical Co., Inc., City of Industry, Calif. (assignee)
Z. L. Burke.
US Patent No 3,882,019, 5 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 282, May 6, 1975.

Descriptors: *Patents, *Water pollution control, *Water pollution treatment, *Water pollution prevention, *Chemical wastes, Industrial wastes, Filtration, Separation techniques, Chemical reactions, Lead, Sulfur compounds.
Identifiers: Process water.

The invention relates to a process for effluent water recovery by stripping lead and sulfuric acid from the effluent water to a level allowing the water to be recirculated as process water and converting the lead and sulfuric acid to a safe and reusable form. Lead carbonate is added to the effluent water in a first agitated enclosure thereby forming water, carbon dioxide, and insoluble lead sulfate. The water is filtered from the lead sulfate and conducted back to the manufacturing process for reuse. The filtered lead sulfate is added to a solution of ammonia, ammonium sulfate, carbon dioxide, and water in a second agitated enclosure to form ammonium sulfate and lead carbonate. The ammonium sulvate liquid is filtered from the lead carbonate and conducted to a holding tank for reuse in a second agitated enclosure. The filtered lead carbonate is dried to remove residual ammonia and then the dried lead carbonate powder may be conducted back to the first agitated enclosure for reuse. The carbon dioxide from the first agitated enclosure and the liberated ammonia from the dryer may be conducted back to the ammonium sulfate holding tank. Finally, excess ammonium sulfate from the holding tank may be conducted to a crystalizer for generation of ammonium sulfate crystals. (Sinha-OEIS)
W75-09648

WASTEWATER CONCENTRATOR WITH SLOTTED DISTRIBUTOR,
Sweco, Inc., Los Angeles, Calif. (assignee)
W. J. Talley, Jr.
US Patent No 3,882,025, 7 p, 8 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 284, May 6, 1975.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, *Screens, *Water pollution sources, Equipment, Storm water, Solid wastes.

A screening apparatus useful for screening of a liquid-solids influent, such as storm water overflow from sewer systems, comprises a cylindrical screening device mounted for rotation with a housing, a slotted distributor for receiving a feed of influent and directing the influent toward the inner surface of the screen as a plurality of influent streams, and outlet means for receiving the effluent which passes through the screen and the concentrate which does not pass through the screen. The screening structure and distributor are mounted within a housing, and suitable collection means are provided for receiving the effluent and the concentrate. The screening structure is in the form of a cylindrical cage and includes a number of screen panels, which may be removed for repair, cleaning or replacement with different mesh screens or different screen cloth. The velocity of flow of influent onto the screen preferably is adjusted to be within a range below which sufficient flow toward the screen does not occur and above which screen damage and splash-back possibility may occur. The rate of flow and volume of influent into and from the distributor, and the angle of the flows of influent from the slots on the distributor may be adjusted to provide a desired rotational speed for the screening structure and a desired centrifugal force. (Sinha-OEIS)
W75-09649

MATERIAL FOR BIOLOGICAL DEGRADATION OF PETROLEUM,
Dunn (John) Agencies Ltd., Vancouver (British Columbia). (assignee)
P. M. Townsley.
US Patent No 3,883,397, 2 p, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 729, May 13, 1975.

Descriptors: *Waste water treatment, *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, Water pollution control, *Microbial degradation, Nutrients, Nutrient requirements.

The invention contemplates the use of microbial nutrients for fostering microbial activity, the nutrients being in dry particulate form. The particles of nutrient are coated with a lipophilic, partially hydrophobic, and bidegradable coating. The particle size is such that particles will remain at the interface of the oil and water or be suspended in the oil so nutrient is slowly released and thus sustain microbial activity over an extended period. Each particle has a core of solid water soluble microbial available nutrient selected from the group consisting of nitrogen in the form of an ammonium compound, phosphorous in the form of a microbial available phosphate compound, and iron in the form of microbial available iron compound. The particle has a coating encapsulating the core composed of a metalic salt of a fatty acid which is lipophylic, partially hydrophobic and biodegradable, the metal in the salt being selected from the group consisting of magnesium, aluminum and calcium. (Sinha-OEIS)
W75-09652

SYSTEM FOR THERMAL DESALTING OF WATER,
For primary bibliographic entry see Field 3A.
W75-09653

DESALINATION PROCESS,
Department of the Navy, Washington, D.C. (assignee)
For primary bibliographic entry see Field 3A.
W75-09654

PROCESS FOR TREATING WASTE WATER,
Etudes et Procedes d'Assainissement Purator (France). (assignee)
S. O. R. L. Lewandowski, and R. Lewandowski.
US Patent No 3,883,426, 7 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 737, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Chemical reactions, *Flotation, Equipment, Mercury.
Identifiers: Aluminum amalgam.

Waste water is purified by means of the flotation process by using aluminum having on at least one surface thereof an amalgam of aluminum and mercury. The hydrogen gas and aluminum produced during the reaction between the waste water and the aluminum amalgam is used to float the impurities to the surface of the waste water being treated. The impurities are then removed and the purified water recovered. The flotation apparatus consists of a tank at one end of which the crude fluid is introduced about half way up. The fluid which has undergone flotation is removed through a siphon-type partition, the wall of which descends below the average height of the fluid and which is located at the other end of the tank. The aluminium plates, treated by means of traces of mercury or of a mercury salt are placed slightly above the bottom. A scraping device is placed above the surface of the fluid in the tank in order to remove the excess thickness of the layer of foam. Heavy sludges are removed at the bottom of the tank. (Sinha-OEIS)
W75-09656

FLOATING SOLIDS RETURN DEVICE,
Oldham (Robert R.), Inc., Sidney, Ohio. (assignee)
R. R. Oldham, and J. H. Wooddell.
US Patent No 3,883,427, 4 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 737, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Settling basins, Water pollution control, Oxidation, Aeration.
Identifiers: Floating solids return.

A sewage treatment system is described in which liquid sewage, containing solids, is conducted into a first or primary settling tank. Liquid is drawn from an intermediate depth of the first tank and conducted to a reducing tank containing an aerator which is operated on a periodic basis and induces a current pattern into the fluid in the reducing tank. A final or outflow settling tank adjacent the reducing tank includes a wall in common with the reducing tank under which settled solids return to the reducing tank. A floating solids return is provided between the outflow and reducing tanks, and includes a provision for utilizing the current flow induced into the reducing tank by the aerator to educt floating solids from the outflow settling tank into the reducing tank. The floating solids return has an opening in the reducing tank which faces in the same direction toward which the current, induced by the aerator, flows. The effluent is drawn from an intermediate depth of the outflow settling tank. (Sinha-OEIS)
W75-09657

PORTABLE WATER SUPPLY SYSTEM,
World Water Resources, Inc., New York. (assignee)
W. E. Hanford.
US Patent No 3,833,429, 6 p, 4 fig, 6 ref,; Official Gazette of the United States Patent Office, Vol 934, No 2, p 738, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Water pollution treatment, Potable water, Water purification, Filtration, Demineralization, Water supply.
Identifiers: Chemical treatment, Portable water supply system.

An apparatus is provided whereby contaminated water is rendered potable. The apparatus comprises: a water source; first and second purification tanks each of which is provided with at least one vertical planar baffle, a prefiltering means; means for pumping water from the source to the filter tank, from the first tank to the second tank and from the second tank to an outlet means; a chemical addition means for chemically treating water in the second tank; and a first and second recycle means for recycling water in the first and second tanks, respectively. (Sinha-OEIS)
W75-09658

SYSTEM FOR PURIFYING AND DISINFECTING WASTE WATER,
K. H. Hildebrand.
US Patent No 3,883,432, 4 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 739, May 13, 1975.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Disinfection, *Water purification, Filtration, Mixing, Equipment, Hospitals, Ships, Water pollution control.

The invention relates to a system for cleaning and disinfecting waste water in hospitals and on ships. The system continuously processes the waste water with small disinfecting agent dosages and produces pure water. A mixing vessel is provided downstream from a container having a disintegrating device. The mixing vessel contains an inlet and an outlet for the waste water and at least one inlet for chemicals. Downstream from the mixing vessel is a closed vessel having an inlet and an outlet for the waste water, a sludge drain, and a filter device. The outlet line of the closed vessel contains a disinfecting apparatus. The inlet and the outlet of the mixing vessel are each connected to a dosage device for a chemical agent. The filter is installed in the vessel in such a way that when cleaning the filter the return sludge of the filter is passed into the sludge drain of the vessel by flowing water through the filter in a reverse direction. (Sinha-OEIS)
W75-09659

REVERSE OSMOSIS APPARATUS,
United Kingdom Atomic Energy Authority, London (England). (assignee)
For primary bibliographic entry see Field 3A.
W75-09661

LIQUID TREATMENT APPARATUS,
ITT Industries, Inc., New York. (assignee)
H. Lindquist.
US Patent No 3,884,812, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1187, May 20, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Aeration, *Water quality control, Turbulent flow, Water circulation, Hydrodynamics, Sludge treatment, Liquid wastes.

An apparatus is described for waste water treatment in which upper and lower horizontally disposed planes, each having the general configuration of an airfoil, are mounted in a ring channel. An aerator is positioned adjacent to the bottom of the channel. The forward portion of the upper plane is disposed in front of the aerator while the entire lower plane is disposed in front of the aerator near the bottom of the channel. The planes cooperate hydrodynamically in such a way that the aerator itself serves to efficiently circulate the water through the channel, as well as aerate the waste sludge in the water. (Sinha-OEIS)
W75-09666

APPLICATION OF FILTRATION THROUGH SEMI-PERMEABLE MEMBRANES FOR TREATMENT OF WASTES,
J. Kepinski, and N. Chlubek.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-781 244, $3.25 in paper copy, $2.25 in microfiche. Translation from Przemysl Chemiczny, Vol 50, No 12, 1971, p 788-791.

Descriptors: *Reverse osmosis, *Membrane processes, *Waste water treatment, Water reuse, Water purification, Reclaimed water, Desalination, Desalination processes, Municipal wastes, Industrial wastes, Radioactive waste disposal, Acid mine water.
Identifiers: Hyperfiltration.

The basis of the hyperfiltration (reverse osmosis) process is discussed as well as the characteristics of membranes and hollow fibers and applications of reverse osmosis in the treatment of industrial and municipal wastes. Reverse osmosis was originally developed as a method of desalting salt and brackish waters. In practice, the pressures used in reverse osmosis are several times greater than the difference between the osmotic pressures of the substrate and the product, in order to compensate for the unfavorable phenomenon of concentration polarization and to increase the speed of the process. Heavy metal ions are relatively easily separated from others by reverse osmosis. It can also be used in the treatment of radioactive wastes where the concern is with reducing the volume before decontamination. An experimental apparatus used for treating the acidic waste water from the Kittanning mine in Pennsylvania was capable of producing over 5 cu m of desalinated water daily. Reverse osmosis is also being used in the treatment of tanning wastes, wastes from cellulose and paper factories, and wastes from other light industrial plants. Reverse osmosis is used for treating municipal waste water where the reuse of water is necessary because of a limited supply. The Los Angeles region reuses municipal wastes treated by reverse osmosis for agricultural and industrial purposes. Regeneration of water from wastes in space-vehicles is another specific application of reverse osmosis. (Orr-FIRL)
W75-09730

ATTITUDES IN SLUDGE TREATMENT AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE5, p 1077-1087, October, 1974. 1 fig, 31 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Waste water treatment, *Reviews, Sewerage, Sewage, Management, Dewatering, *Attitudes.

A critical analysis of current practices of sludge management is presented. Sludge treatment and disposal involve thickening, conditioning, dewatering, conversion, transportation, and ultimate disposal. Materials incompatible with attempts to reclaim sludge materials or disposal of sludge should not be allowed in sewers. Sludge treatment and disposal must both be a part of the design of overall waste management facilities. The effects of both waste water treatment practices on sludge disposal and of sludge treatment practices on waste water treatment processes need to be evaluated more carefully than they have been in the past. Not all waste water treatment plants need sludge treatment and disposal facilities. Large-scale regional collection and disposal systems which would eliminate sludge handling at most plants are economically feasible and ecologically sound. Removal of water from sludges is neither necessary nor economically justified. Many present sludge management techniques do not include provision for ultimate disposal of the sludge but rather provide for the accumulation of sludges. Improvements are needed in the technology involved in present sludge treatment handling and disposal schemes as well as a reevaluation of some

of the basic approaches to the problem. (Orr-FIRL)
W75-09731

OPERATING RESULTS OF ELECTRODIALYSIS AND REVERSE OSMOSIS MUNICIPAL DESALTING PLANTS,
Reynolds, Smith and Hills, Jacksonville, Fla.
R. T. Skinde, and T. L. Tang.
National Water Supply Improvement Association Journal, Vol 1, No 1, p 15-21, July, 1974. 8 tab.

Descriptors: *Desalination, *Reverse osmosis, *Electrodialysis, *Potable water, Public health, Water supply, Membrane processes, Water purification, Facilities, Costs, *Waste water treatment.

Electrodialysis and reverse osmosis are the two primary membrane processes utilized in the desalination of salt and brackish water. Their use to provide potable drinking water from brackish waters is now accelerating rapidly. In January, 1972, there were 812 land-based desalting plants of 25,000 gpd capacity or larger throughout the world. Electrodialysis treatment with 30 percent salt passage of a well water with 2000 ppm TDS results in a product water of 600 ppm TDS, which is 100 ppm higher than the permissible level. However, reverse osmosis can treat well waters with much higher TDS contents. Treatment of a well water of 7000 TDS by reverse osmosis with 6 percent salt passage reduced the TDS content in the product water to 420 ppm TDS. The greatest application of electrodialysis is for low TDS waters which will not increase substantially over the years; reverse osmosis should be used where the TDS level is higher and a degradation of well water quality over the years is expected. The operating results of three electrodialysis and three reverse osmosis municipal treatment plants are summarized. A comparative analysis is presented of product water quality and operating costs in plants based upon these two membrane processes. (Orr-FIRL)
W75-09732

CARBON FROM LIGNITE OR COAL: WHICH IS BETTER,
ICI United States, Inc., Wilmington, Del.
P. B. DeJohn.
Chemical Engineering, Vol 82, No 9, p 113-116, April, 1975. 3 fig, 3 tab, 8 ref.

Descriptors: *Waste water treatment, *Activated carbon, *Adsorption, Municipal wastes, Industrial wastes, *Lignite, *Coals, *Carbon.

Granular carbons produced from medium-volatile bituminous-coal or lignite are the best activated carbons for use in waste water treatment. Factors to be considered when selecting a particular type include: ability to absorb enough impurities to meet allowable effluent standards; reasonable losses during carbon regeneration; minimal pressure drop and operating problems; and, lowest operating costs. More than fifty comparative granular carbon studies were performed on various municipal and industrial effluents including those from tertiary municipal treatment, oil refineries, dye plants, and pulp and paper mills. The two types of carbon produced from coal or lignite performed equally well on an equivalent volume basis when treating domestic waste streams. The most important factor that determines the absorption capacity of a carbon is available surface area. Bituminous-coal carbon has a greater total surface and more surface in the micropore range, while lignite carbon has more surface area in the transitional-pore range. Therefore, a lignite carbon performs better than a bituminous-coal carbon when treating a waste stream containing pollutants with mostly large molecules. Bituminuous-coal carbon adsorbs small-molecule pollutants better than lignite carbon because it has more available surface area in the micropore range. However, thermal regeneration destroys the surface area in this range and after several regenerations both carbons perform about the same. Lignite carbons regenerate faster and under milder conditions than bituminous-coal carbons. (Orr-FIRL)
W75-09733

URBAN RUNOFF POLLUTION CONTROL--STATE-OF-THE-ART,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Field, and J. A. Lager.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE1, Paper 11129, p 107-125, February 1975. 4 fig, 2 tab, 22 ref, 2 append. EPA Contract 68-03-0179.

Descriptors: *Reviews, *Urban runoff, *Storm runoff, *Storm drains, *Surface runoff, *Cost analysis, Environmental sanitation, Waste water treatment, Flow control, Waste storage, Overflow, Combined sewers, Treatment, Hydrology, Sewage treatment, Water pollution, Drainage, Bacteria.
Identifiers: *Swirl regulator/concentrator, *Flow regulators.

Combined sewer overflows are major sources of water pollution problems, but even discharges of stormwater alone can seriously affect water quality. Current approaches involve control of overflows, treatment, and combinations of the two. Control may involve maximizing treatment with existing facilities, control of infiltration and extraneous inflows, surface sanitation and management, as well as flow regulation and storage. A number of treatment methods were evaluated including high rate screening and microstraining, ultra-high rate filtration, dissolved air flotation, physical/chemical treatment, and modified biological processes. A swirl flow regulator/solids separator of annular shape construction with no moving parts was highly developed. High rate disinfection methods including new disinfectants were applied. Promising approaches involve intergrated use of controls and treatment. (Lardner-ISWS)
W75-09762

CATALYTIC OXIDATION OF PHENOL IN AQUEOUS SOLUTION OVER COPPER OXIDE,
Delaware Univ., Newark. Dept. of Chemical Engineering.
A. J. Sadana, and J. R. Katzer.
Industrial and Engineering Chemistry Fundamentals, Vol 13, No 2, p 127-134, 1974. 9 fig, 2 tab, 51 ref, OWRT A-014-DEL(10).

Descriptors: *Oxidation, *Catalysts, *Chemical reactions, *Phenols, Kinetics, Industrial wastes, *Waste water treatment, Ultimate disposal, Chemical wastes, Aqueous solutions.
Identifiers: Aqueous-phase oxidation, *Catalytic oxidation, Free radical.

Catalytic oxidation of phenol in aqueous solution over supported copper oxide was studied in the batchwise mode at atmospheric and above-atmospheric pressure and between 369 and 419K. The reaction undergoes an induction period and transition to a much higher, steady-state activity regime. The reaction is first order with respect to phenol in both regimes, but the oxygen dependency decreases from first to one-half order in shifting from the induction period to the steady-state activity regime. The rate shows other than first-order behavior with respect to catalyst loading. The reaction is proposed to involve a free-radical mechanism. Oxidation rates at atmospheric pressure conditions are too slow to be of practical interest but can easily be brought into the range of practical importance by only moderate increases in temperature and operating pressure.
W75-09772

MODIFICATIONS TO THE EXECUTIVE COMPUTER PROGRAM FOR STEADY-STATE SIMULATION OF WASTEWATER TREATMENT FACILITIES,
Curran Associates, Inc., Northampton, Mass.
P. M. Meier, and G. R. Fisette.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 497, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-066, July 1974. 59 p, 7 fig, 15 ref.

Descriptors: *Computer programs, *Treatment facilities, *Waste water treatment, Water quality control, Sludge, Simulation models, Streams, Costs, Mathematical models, Combined treatment, Tertiary treatment.

An extended version is presented of the executive computer program for the steady-state simulation of waste water treatment facilities. This was originally developed at the National Environmental Research Center of the Environmental Protection Agency at Cincinnati, Ohio. The feasibility of joint treatment of sewage and ground refuse at modified waste water treatment facilities was evaluated. Major modifications of the computer program include an increase from 20 to 50 quality parameters, an increased capacity to accommodate 100 treatment processes and 200 streams rather than the original 25 processes and 25 streams, and an incorporation of the most recently developed cost functions, used for most of the unit processes. New mathematical models of advance waste treatment processes were adapted for inclusion into the program. In addition, new subroutines were developed for a number of preliminary and sludge handling processes. (Prague-FIRL)
W75-09775

EXTENDED AERATION WASTEWATER TREATMENT,
J. T. Yang, R. Waller, and C. W. Mallory.
Canadian Patent 954,242. Issued September 3, 1974. Patent Office Record, Vol 102, No 36, p 84, September, 1974.

Descriptors: *Patents, *Aeration, *Waste water treatment, *Waste treatment, Sludge, Equipment, Clarification, Design, Construction.
Identifiers: *Extended aeration.

An improved extended aeration process is performed in a single tank. Wastes are aerated for periods ranging from 12 to 24 hours. During this time they are circulated in the tank in a controlled manner to avoid settling and compaction. The concentration of mixed liquor is maintained by the selective removal of clarified effluent. This eliminates the need for quiet zones for the settling of solids and for the return of compacted sludge to the aeration process. The apparatus is of modular construction and avoids the problems associated with sludge compaction. The preferred form is capable of being fabricated from planar elements either as a complete unit or as internals for installation in other types of tankage. (Orr-FIRL)
W75-09776

ACTIVATED CARBON USED TO CONTROL ODORS,
Calgon Corp., Pittsburgh, Pa.
W. D. Lovett, and R. L. Poltorak.
Water and Sewage Works, Vol 121, No 8, p 74-75, August, 1974. 1 fig.

Descriptors: *Activated carbon, *Odor, *Adsorption, *Sewage treatment, Pollution abatement, Tertiary treatment, *Waste water treatment.

Activated carbon adsorption systems are discussed as means for controlling odors from typical low concentration/large volume emissions, storage tanks, reactor vessels, and other small volume sources. Activated carbon's ability to adsorb organic and some inorganic materials in

preference to water vapor is due to its non-polar surface. Organic substances with molecular weights greater than 45 and boiling points higher than 0C are readily absorbed. Activated carbon can be reused after being regenerated. Regeneration can be accomplished by passing hot gas or steam through the carbon bed, by heating the carbon in a furnace, by a pressure swing such as the use of a vacuum, or by a combination of heat and vacuum, solvent washing or chemical treatment. The ability of activated carbon to increase the concentration of a combustible material can be utilized to decrease the fuel requirement for an incinerator. Many complaints about odors have been received by sewage treatment plants throughout the United States. One installation in California is controlling odors from trickling filters with hypochlorite scrubbing and subsequent adsorption. Odors from primary clarifiers can also be adsorbed by activated carbon. Carbon systems may be made more efficient by decreasing cycle times and/or adsorption temperatures. (Orr-FIRL)
W75-09777

HOW TO GET LOW AMMONIA EFFLUENTS,
F. F. Sampayo.
Water and Sewage Works, Vol 121, No 8, p 92-94, August, 1974. 3 tab.

Descriptors: *Waste water treatment, *Pilot plants, *Trickling filters, *Ammonia, *Nitrification, *Sewage treatment, Filtration, Biochemical oxygen demand, Suspended solids, Plastics, *Ohio, Treatment facilities.
Identifiers: Surfpac, Plastic media, Lima(Ohio).

The use of a plastic media trickling filter (Surfpac) for removing ammonia from effluents was studied at the Lima, Ohio, waste water treatment plant. The pilot plant was a steel shell 3 ft in diameter and 30 ft high packed with 21.5 ft of Surfpac media. Analysis of the summertime results showed that: plastic media trickling filters can produce effluents with less than 0.5 mg/liter ammonia nitrogen levels; recirculation of the filter effluent was beneficial in producing a more stable ammonia nitrogen concentration when the flow rate was high; the major effect of the tower was nitrification rather than stripping of the ammonia; and no net BOD removal or change in suspended solids concentration or pH value was effected by the tower. Analysis of the wintertime data showed that: ammonia oxidation was reduced in the winter; ammonia nitrogen levels less than 1.0 mg/liter were unobtainable; no BOD removal occurred through the tower; some of the suspended solids were removed by the tower; and the pH of the waste increased 0.1 units through the tower. Plastic media in nitrification towers are a viable means for removing ammonia nitrogen. However, to maintain very low ammonia nitrogen levels all year, breakpoint chlorination may be necessary for final polishing. The process is reliable and does not require skilled operators. (Orr-FIR)
W75-09778

SOUND WAVES AND OZONE STERILIZE WASTEWATER.
The American City, Vol 89, No 9, p 137, September, 1974. 2 fig.

Descriptors: *Waste water treatment, *Water pollution, *Chlorination, *Sound waves, *Ozone, Coagulation, Polymers, Sludge removal, Filtration, Bacteria, Virus, Public health.
Identifiers: *Sonozone treatment, *UHF sound waves, Rapid sand filters, Vertical pressure filters.

Effluent sterilization by UHF sound waves and ozone, is an effective method of disinfection and eliminates the hazards associated with chlorinated hydrocarbons released during chlorination. The estimated savings are about one cent per 1000 gallons. The treatment includes chemical coagulation, using iron salts and polymer additives to remove much of the phosphates and some nitrates; settling for sludge removal; rapid sand filtration; and sonics with ozone emitted from Welsbach generators. Bacteria are dispersed by the sonic waves. When the aggregate particles are broken up, a greater surface area is exposed to ozone oxidation, and the ozone demand is reduced. The sonics-ozone treatment is most helpful in plants now requiring prechlorination or intermediate chlorination during the treatment process. Waste water is retained only half the time of a conventional plant. The system destroys polio virus, cholera, salmonella, shigella, E. coli, staphylococcus and other microorganisms of public health concern associated with waste water. (Leibowitz-FIRL)
W75-09779

ALTERNATIVE METHODS OF DISINFECTION: HOW EFFECTIVE,
K. J. Roberts, and A. H. Vajdic.
Water and Sewage Works, Vol 121, No 9, p 72-75, September, 1974. 1 tab, 18 ref.

Descriptors: *Chlorination, *Disinfection, *Ozonation, *Gamma rays, *Waste water treatment, Environmental effects, Aquatic life, Bacteria.
Identifiers: Dechlorination, Residual chlorine.

Alternatives to chlorination for waste water or process water disinfection include dechlorination, chemical oxidation, and the use of ultraviolet and gamma ray ionizing radiation. Inactivation of coliforms, fecal coliforms, fecal streptococci, total bacterial count, bacteriophage, and salmonellae by gamma irridation and chlorine were compared. Effluent from an irradiation reactor was non-toxic to goldfish for periods up to six weeks. For certain treatment methods, further toxicity studies are suggested. Of the chemical methods, ozonation shows the most promise, especially with an added benefit of high residual dissolved oxygen in the effluent. With further research, deleterious effects of residual chlorine on aquatic life may be avoided by use of alternate treatment methods. (Prague-FIRL)
W75-09780

INTEREST IN OXYGEN PROCESS GROWING,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 46, No 11, p 2449-2451, November, 1974.

Descriptors: *Waste water treatment, *Municipal wastes, *Industrial wastes, *Activated sludge, *Oxygenation, Aeration.
Identifiers: *High-purity oxygen activated sludge.

The high purity oxygen activated sludge process is becoming an established waste water treatment technique. Detroit, Tampa, and New Orleans are planning domestic waste water treatment plants utilizing this approach. Food processors, petrochemical manufacturers, and pulp and paper mills have employed the concept with apparent success. Four primary improvements over conventional air systems are claimed for oxygen activated sludge: increased stability; shorter detention times and consequently, more compact facilities; superior sludge characteristics; and, more efficient energy use. The key element of this system is the high degree of gaseous oxygen utilization. A high purity oxygen system is capable of a much higher level of oxygen dissolution than is a conventional air system, because the partial pressure of the oxygen in the aeration gas is the driving force for dissolution. The continuously renewed high concentration of oxygen supplied by the system preserves aerobic conditions while maintaining mixed liquor suspended solids concentrations ranging from about 4,500 to 8,000 mg/liter. The richly oxygenated, high MLSS concentration is responsible for the rapid rate of treatment obtained, cushions the process to shock loading, and makes it possible to treat a large volume of waste water in a relatively small facility. (Orr-FIRL)
W75-09781

PHYSICAL CHARACTERISTICS OF MECHANICAL AERATORS,
G. F. G. Clough.
Water Pollution Control, Vol 73, No 5, p 564-575, 1974. 9 fig, 3 ref.

Descriptors: *Aeration, *Activated sludge, *Sewage treatment, Equipment, Operational costs, Dissolved oxygen, *Waste water treatment.
Identifiers: *Aerators(Mechanical).

Mechanical aerators used for the activated sludge process of sewage treatment are discussed. Selection of an appropriate aerator is dependent upon a number of characteristics. New aerator designs thus far have shown no significant improvement over previous ones. Functions of a mechanical aerator include: dissolving oxygen in the water within the aeration tank; maintaining the activated sludge solids in suspension; mixing the water containing dissolved oxygen with the solids so that the bacteria have a continuous supply of dissolved oxygen; distributing waste throughout the tank; and removing some carbon dioxide from the solution. In addition, the aerator cools the aeration tank contents, produces spray or mist, may cause foaming, and produces some noise. Selection of a particular aerator should be based on the importance of its various functions, the net oxygen transfer efficiency, and the operational costs involved. (Prague-FIRL)
W75-09782

SEWAGE UTILIZATION IN AGRICULTURE,
Central Public Health Engineering Research Inst., Nagpur (India).
G. B. Shende.
Indian Farming, Vol 23, No 11, p 25-27, February 1974.

Descriptors: *Sewage, *Water quality, *Irrigation water, *Arid climates, *Sewage effluents, Nutrients, Organic matter, Fertilizers, Soil physical properties, Drainage, Public health, *Water reuse, Waste water treatment.
Identifiers: *Sewage farming, *India.

Reclamation and reuse of waste waters for agricultural use is a practical proposition in India. The problems and solutions should be investigated for maximizing the use of plant nutrients and organic matter without jeopardizing soil productivity and environment. The value of sewage for agricultural purposes lies in the presence of major and minor plant nutrients, irrigation water, and organic matter. Proper management in sewage farming is necessary to prevent public health problems such as food and water contamination, insects and odors. To achieve the maximum benefit from sewage utilization, scientific practice of irrigation is a must. Dilution of the sewage or flooding the soil with good quality water once or twice a year is desirable to leach down accumulated salts. Sewage farming should not be practiced if drainage is poor or where the water table is less than six feet below the soil surface. Additional research is needed and proper management guidelines need to be developed to increase sewage utilization for agriculture. (Mastic-Arizona)
W75-09788

WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR THE LOWER RARITAN RIVER BASIN AND FOR THE SOUTH SHORE OF RARITAN BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, New York. Region II.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-NJ-73-1167-F, $8.50 in paper copy, $2.25 in microfiche. July 1973. 253 p, 39 map, 1 graph, 40 tab.

Descriptors: *Sewerage, *Water quality, *Waste water(Pollution), Environmental effects, *Waste

water treatment, *New Jersey, *New York Atlantic Ocean, Sewage, Sewers, Sewage districts, Effluents, Waste water disposal, Marine biology, Sludge disposal, Sludge, Bays, Groundwater.
Identifiers: *Environmental Impact Statements, Middlesex and Monmouth Counties(NJ), Atlantic Highlands(NJ), *Raritan Bay(NY).

Funds have been requested from the EPA by the Sewerage Authorities of Middlesex and Monmouth Counties, New Jersey, for projects which involve additions and alterations to an existing sewage treatment plant and construction of sewers and a new sewage treatment plant. The waters of Raritan Bay, contiguous to the state of New York will be affected as will be the Atlantic Ocean, east of Atlantic Highlands, New Jersey. The environmental impact of the project consists of improving the quality of receiving waters by providing secondary treatment of wastewater prior to discharge, allowing cessation of waste water discharge into inland streams that have low assimilative capacities, and providing the concerned communities with centralized sewage treatments. The highly treated effluent will be introduced into the marine environment and there will be a waste sludge produced at the treatment plant. Adverse environmental effects include further lowering of groundwater levels, increased saltwater encroachment, and possible contamination of the marine environment at the sites of effluent and sludge disposal. Alternatives to the project are no action, various degrees of expansion in the service area, a regional sewerage system with bay outfall and a regional sewerage system with ocean outfall. (Gagliardi-Florida)
W75-09817

5E. Ultimate Disposal Of Wastes

TREATMENT AND SAFE DISPOSAL OF CATIONIC COATING COLORS,
Merck and Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W75-09352

WHERE ARE WE IN FOREST FERTILIZATION,
State Univ. New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 5D.
W75-09367

SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER, VOLUME I. SUMMARY AND MAJOR FINDINGS,
J. J. Reinhardt, and R. K. Ham.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 930, $6.25 in paper copy, $2.25 in microfiche. EPA Report EPA/530/SW-62d.1, 1974. 165 p, 53 fig, 35 tab, 7 ref, 2 append.

Descriptors: *Landfills, *Solid wastes, Wastes, Design criteria, *Waste disposal, *Wisconsin.
Identifiers: *Madison(Wisc), Millfill, Sanitary landfills, Land application.

Highlights of seven years work at Madison, Wisconsin, are summarized. The concept of landfill disposal of milling refuse without daily cover was tested. Data were gathered on the operation and cost of milling equipment, the use of milled refuse in landfill, and the characteristics of milled refuse. Eventually, detailed investigations were made of both milled and unprocessed solid waste. While landfilled milled solid waste, or millfill, was highly approved by European landfill operators, further experiments in Wisconsin were seen as necessary. Study included determination of the effects of landfill on rats, filies, leachate, gas and trees, for quantification of various factors. (See also W75-09402) (Prague-FIRL)
W75-09401

SOLID WASTE MILLING AND DISPOSAL ON LAND WITHOUT COVER. VOLUME II. DATA CONDENSATIONS,
J. J. Reinhardt, and R. K. Ham.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-234 931, $11.25 in paper copy, $2.25 in microfiche. EPA Report EPA/530/SW62d.2, 1974. 445 p, 111 fig, 123 tab, 16 append.

Descriptors: *Solid wastes, *Landfills, Costs, *Waste disposal, Environmental effects, Data collections, *Wisconsin.
Identifiers: Millfill, Sanitary landfill, *Madison(Wisc), Hammermill.

Individual research projects are described on the feasibility of using milling refuse for landfilling without daily cover. The demonstration projects were conducted between 1966 and 1972. Milling was begun in Europe to provide material suitable for composting. Originally single-rotor or double-rotor hammer mills handled homogeneous materials, necessitating manual sorting of larger, ungrindable items. Automation has been used in Europe since the 1950's. The Heil Company of Milwaukee, Wisconsin, installed a Gonard hamermill at the Madison Refuse Reduction Plant in 1967. Topics include: the Gondard operation; the Tollemache operation; two-mill, two-shift operations; and the costs of landfilling milled refuse. Vector studies were done of rats and flies at Madison and of rats at Purdue University. Observations were made on products of decomposition-leachate and gas as well as the effects on tree growth and other vegetation. Sixteen appendices detail the costs and quantities (dollars and tons) for milling and solid wastes at the Gonard and Tollemache operations. (See also W75-09401) (Prague-FIRL)
W75-09402

EVALUATION OF MUNICIPAL SEWAGE TREATMENT ALTERNATIVES.
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-09404

A PRELIMINARY ASSESSMENT OF WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION,
Curran Associates, Inc., Northhampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09405

ECONOMIC ANALYSIS OF THE PROCESSING AND DISPOSAL OF REFUSE SLUDGES,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09406

WET SYSTEMS FOR RESIDENTIAL REFUSE COLLECTION: A CASE STUDY FOR SPRINGFIELD, MASSACHUSETTS,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09407

AGRICULTURAL BENEFITS AND ENVIRONMENTAL CHANGES RESULTING FROM THE USE OF DIGESTED SLUDGE ON FIELD CROPS,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W75-09409

COMPREHENSIVE SURVEY OF MAGPIE CREEK, MCCLELLAN AIR FORCE BASE, CALIFORNIA,
Environmental Health Lab., McClellan AFB, Calif.
For primary bibliographic entry see Field 5D.
W75-09410

WASTEWATER TREATMENT FACILITY EVALUATION, MALMSTROM AFB MT,
Environmental Health Lab., McClellan AFB, Calif.
C. F. Pauls.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-784 844, $4.75 in paper copy, $2.25 in microfiche. Professional Report No. 74M-1, January 1974. 85 p, 6 fig, 18 tab, 6 append.

Descriptors: *Surveys, *Waste water treatment, Flow rates, Suspended solids, Biochemical oxygen demand, Water quality standards, Waste disposal, Planning, *Treatment facilities, Montana, *Evaluation.
Identifiers: Malmstrom AFB(Mont).

A survey was performed of the Malmstrom, Montana, AFB waste water treatment facility. Its objectives included: documentation of existing flow rates; determination of treatment efficiencies for BOD5 and suspended solids removal; analysis of influent waste stream chemical composition to determine if toxic substances limited biomass growth on trickling filters; evaluation of the quality of operation control; and evaluation of laboratory procedures used for waste water analysis. During the survey period the total daily flow treated averaged 0.89 mgd. The Malmstrom AFB waste water treatment facility did not remove a sufficient quantity of BOD and suspended solids to meet secondary treatment standards set by the Environmental Protection Agency. No toxic chemicals were found in the influent waters, however. The facility's treatment inefficiency was not attributed to a single factor but to a combination of inconsistent operational control, poor maintenance, and inflexible design. Several specifications of the treatment facility are detailed which must be improved to meet both existing water quality requirements and future performance conditions to be set forth in the newly required NPDES discharge permit of the Environmental Protection Agency. (Prague-FIRL)
W75-09411

VOLUME EXTRACTION OF CHEMICALLY CONTAMINATED WATER,
Westinghouse Electric Corp., Abingdon, Va. Wire Div.
For primary bibliographic entry see Field 5D.
W75-09419

FILTER-PRESSING WASTEWATER SLUDGE.
For primary bibliographic entry see Field 5D.
W75-09420

DISPOSAL OF CATTLE FEEDLOT RUNOFF ON AGRICULTURAL LAND,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-09517

MOVEMENT OF POLLUTANT PHOSPHORUS IN UNSATURATED SOIL,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-09527

MUNICIPAL SLUDGE MANAGEMENT, PROCEEDINGS OF THE NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT.
For primary bibliographic entry see Field 5D.
W75-09532

OVERVIEW OF SLUDGE HANDLING AND DISPOSAL,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09533

ALTERNATIVE METHODS FOR SLUDGE MANAGEMENT,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W75-09534

THICKENING OF SLUDGES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-09535

HEAT TREATMENT AND INCINERATION,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W75-09541

DRYING OF SLUDGE FOR MARKETING AS FERTILIZER,
Houston Sewage and Sludge Disposal Plant, Tex.
M. T. Garrett, Jr.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 93-95, 1974. 3 fig, 2 ref.

Descriptors: *Fertilizers, *Sludge treatment, Activated sludge, Drying, Texas, Waste treatment.
Identifiers: Houston(Tex), *Dried sludge.

The use of the activated sludge process and the subsequent drying and marketing of solids removed as fertilizer are discussed. In order to produce a marketable fertilizer, the nitrogen content must be kept as high as possible. This involves drying activated sludge so as to minimize the moisture, ash, grease, and cellulose. Costs of the buyer include freight costs on the total weight of the material, which in effect determine whether or not the sale is profitable. Sludge treatment processes at Houston, Texas are described. For the City of Houston, the revenue from selling fertilizer is about $21 per ton. (See also W75-09532) (Prague-FIRL)
W75-09542

GROWTH OF BARLEY IRRIGATED WITH WASTEWATER SLUDGE CONTAINING PHOSPHATE PRECIPITANTS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09543

THE ECONOMICS OF SLUDGE IRRIGATION,
Springfield Sanitary District, Ill.
For primary bibliographic entry see Field 5D.
W75-09545

COMPOSTING SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
For primary bibliographic entry see Field 5D.
W75-09546

RECENT SANITARY DISTRICT HISTORY IN LAND RECLAMATION AND SLUDGE UTILIZATION,
Metropolitan Sanitary District of Greater Chicago, Ill.
J. L. Halderson, B. T. Lynam, and R. R. Rimkus.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 129-133, 1974.

Descriptors: *Treatment facilities, *Sludge disposal, Nutrients, Irrigation, Agriculture, Experimentation, Land reclamation, Illinois, Waste treatment.
Identifiers: *Land application, Air dried sludge, Chicago(Ill).

Three major treatment plants handle the flow of sewage sludge in the area around Chicago in Cook County, Illinois. The sludge processed by an air dried method has the best nitrogen:phosphorus:potassium ratio for land utilization. The organic content of this air dried sludge is essentially humic matter. With the use of this sludge, land has been reclaimed in seven experimental projects. These occurred at the Northwestern University Campus land, at Ottawa, Illinois, Hanover Park, Calument Farm, at the Palzo Project in the Shawnee National Forest, at the Arcola Project, and at the Elwood Agronomy Research Center. One significant result of the research is an indication that application of freshly digested sludge can inhibit seed germination. If, however, the sludge is applied about one week prior to planting or if the sludge has been lagooned for a long enough time, germination is normal. In 1970, the Sanitary District of Chicago purchased land in Fulton County, Illinois, about 200 miles away from the sludge treatment facilities. Sludge is transported there by barge down the Illinois River, and the system of distribution, application, and subsequent cropping is described. Future plans for the Fulton County site and elsewhere include leveling the reclaiming unproductive land, as well as adding organic matter from sewage sludges to sites of strip mine spoils. (See also W75-09532) (Prague-FIRL)
W75-09547

SLUDGE MANAGEMENT IN ALLEGHENY COUNTY,
Allegheny County Dept. of Public Works, Pa.
R. M. Cosentino.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 135-138, 1974. 6 ref.

Descriptors: *Sludge disposal, *Treatment facilities, Fly ash, Municipal wastes, Solid wastes, Planning, Legislation, Pennsylvania.
Identifiers: Allegheny County(Pa), Sludge management.

In the Allegheny County, Pennsylvania, area, solid waste management and sludge management are closely linked. Information is given about current practices. All new applicants for treatment facilities must provide data to the Pennsylvania Department of Environmental Resources as a regulatory agency. A feasibility study is being planned for a project of restoration of strip mine lands using municipal treatment plant residues and fly ash. Another research project planned is processing of dewatered undigested sludge produced at the Pine Creek water pollution control facility. (See also W75-09532) (Prague-FIRL)
W75-09548

TRENCH INCORPORATION OF SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, Md. Biological Waste Management Lab.
J. M. Walker.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 139-149, 1974. 4 fig, 4 tab, 5 ref.

Descriptors: *Sludge disposal, *Waste water treatment, *Sewage sludge, Agriculture, Nitrogen, Drainage, Municipal wastes, District of Columbia, Treatment facilities.
Identifiers: Entrenchment, Blue Plains Plant(Washington DC), Trench incorporation.

The Blue Plains Plant, which serves much of the metropolitan Washington, D.C. area, has had serious sludge disposal problems. In order to discharge secondary effluents into the Potomac River, BOD had to be reduced. This reduction, by the use of ferric chloride or alum, increased the quantities of sludge produced, which necessitated additional sludge disposal. A research and demonstration study was undertaken to evaluate the trenching of raw and digested sewage sludge to improve marginally usable agricultural soils and to provide an environmentally and politically acceptable solution to sludge disposal. Field testing of the procedures in all weather, drainage control evaluation, monitoring of nitrogen, pathogens, and heavy metals in groundwater and surface waters, as well as supporting laboratory and greenhouse studies were conducted. The most likely difficulty was that nitrogen from the sludge might reach underground water. This problem could be minimized by underdraining the entrenchment site and retaining the drained water for irrigating the surrounding land. Entrenchment prevented contamination of surface water, buried pathogens, promoted slow nitrogen release, and favored denitrification. (See also W75-09532) (Prague-FIRL)
W75-09549

OCEAN DISPOSAL EXPERIENCES IN PHILADELPHIA,
Philadelphia Water Dept., Pa.
C. F. Guarino, and S. Townsend.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 151-155, 1974.

Descriptors: *Sewage disposal, *Legislation, Metals, Ocean disposal, Sewage sludge, Regulation, Mercury, Cadmium, Pennsylvania, Waste treatment.
Identifiers: Philadelphia(Pa), Marine Protection Act.

From 1961 to May, 1973, the city of Philadelphia had been disposing of its sewage by barge to an area 13 miles off Cape Henlopen, Delaware. In 1972, the United States passed the Marine Protection, Research and Sanctuaries Act, which effected a permit system whereby the dumper would have to meet specific requirements. The permit received by Philadelphia required that a new site be chosen 50 miles off the coast, that an expanded cost analysis be conducted, and that monitoring be continuous at the new location. Another provision of the Act requires that the City determine the sources, relative contributions, and controllability of heavy metals within the City's drainage area. At present, Philadelphia sludge exceeds the criteria for mercury and cadmium as defined by the Act. However, there is a conflict as to whether the laboratory analysis is accurate (its range is large) and whether or not the criteria are too stringent. Another problem is the interaction of wastes within a disposal area. Because Philadelphia was required to dump 50 miles offshore, a nearby disposal for acid wastes may be interacting with the sludge to cause flocculation. Alternatives to ocean disposal are three to four times more costly to the City, and land disposal requires a continually increasing amount of land space. Implementation of the Marine Pollution Act pointed out that regulations should not overcontrol or create new problems. However, the regulation has prompted research into new areas of knowledge of sludge disposal. (See also W75-09532) (Prague-FIRL)
W75-09550

SLUDGE DISPOSAL BY INCINERATION AT ALCOSAN,
Allegheny County Sanitary Authority, Pittsburgh, Pa.
G. A. Brinsko.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 157-161, 1974. 5 fig, 3 ref.

Descriptors: *Sludge treatment, *Incineration, *Sludge disposal, Odors, Costs, Waste disposal, Public rights, Combustion, Solid wastes, Pennsylvania, Waste treatment.
Identifiers: Pittsburgh(Penna).

The Allegheny County Sanitary Authority, or Alcosan, has controlled the problems of sludge treatment and disposal for the Pittsburgh area since the middle 1940's. It was decided in 1945 that incineration would be used for final sludge disposal rather than to discharge wastes into the rivers. Facilities from 1959 to 1973 provided intermediate treatment only slightly better than primary. Final disposal was accomplished in C. E. Raymond Flash-Drying incinerators. In 1973, modernization occurred, the present incinerators are evaporators of water. This method of disposal has caused many problems, and is extremely costly. Thirty-seven percent of Alcosan's operating budget is related to the incinerator operation and fifty percent of the overall range maintenance budget goes toward upkeep of incinerators. Odors from the incinerators have caused severe public reaction. Hydrogen peroxide has so far been the most effective chemical for combatting this problem. Incineration of primary and waste activated solids together has created the problem of an increased heat value of the sludge. chamber temperatures range from 1650 F to 1900 F and cause slagging. The accumulated slag must be removed, resulting in a loss of furnace time. A new duct system may alleviate this situation. In spite of the problems associated with incineration, the method was chosen because of the lack of available land and the fact that the Pittsburgh sludge is too low in nitrogen to reclaim the material as fertilizer. An alternate solution might be to incinerate both sewage and solid waste materials together for the generation of steam as a profitable by-product. (See also W75-09532) (Prague-FIRL)
W75-09551

PASTEURIZATION OF LIQUID DIGESTED SLUDGE,
Cincinnati, Ohio National Environmental Research Center.
For primary bibliographic entry see Field 5D.
W75-09552

SLUDGE HANDLING AND DISPOSAL AT BLUE PLAINS,
District of Columbia Dept. of Environmental Services, Washington.
For primary bibliographic entry see Field 5D.
W75-09553

AGRICULTURAL UTILIZATION OF DIGESTED SLUDGES FROM THE CITY OF PENSACOLA,
Baseline, Inc., Pensacola, Fla.
J. A. Edmisten.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 177-182, 1974. 9 fig, 5 tab, 4 ref.

Descriptors: *Sludge disposal, *Agriculture, Sewage treatment, Soils, *Florida, Land use, Lagoons, Bacteria, *Sludge treatment, Waste water treatment.
Identifiers: *Liquid digested sludge, Land application, Pensacola(Fla).

Previous to 1974, the digested liquid sewage sludge from the Pensacola Main Street Sewage Treatment Plant was disposed of by dumping the material at a sanitary landfill 18 miles away. In 1973, the County Commission of Escambia County Florida and the City Council of Pensacola conducted an experiment, using liquid digested sludge for agricultural production on deep sandy coastal plains soils. Greenhouse experiments established the rates of sludge application tolerable to tomatoes, corn, and a variety of horticultural materials. Test fields and plots have been designed to control application. When soils are too wet for direct application, tankers carrying sludge dump it into a holding lagoon. Precautions against bacterial hazards are being tested by feeding dried sludge to test animals, which will be slaughtered after six months and their tissues examined. Crops are being grown on small test plots with varying rates of sludge applications; crop responses so far seem to be similar to those of earlier greenhouse studies. With organic matter accumulation, it is likely that cyst nematodes, a pest to soybeans, will be destroyed, thus yielding better crops. (See also W75-09532) (Prague-FIRL)
W75-09554

INSTITUTIONAL PROBLEMS ASSOCIATED WITH SLUDGE DISPOSAL,
Washington Suburban Sanitary Commission, Hyattsville, Md.
K. J. Brough.
In: Municipal Sludge Management, Proceedings of the National Conference on Municipal Sludge Management, June 11-13, 1974, Pittsburgh, Pennsylvania, p 183-186, 1974. 4 ref.

Descriptors: *Public rights, *Public health, Information, Regulations, Municipal wastes, Waste water treatment, *Sludge disposal, Treatment facilities, Incineration, Environmental effects, Planning, Maryland, Waste disposal.
Identifiers: Piscataway(Maryland).

Public attitudes on sludge disposal cause institutional problems which effect regulations for municipal sludge treatment and disposal. In one example, at the Piscataway (Maryland) Wastewater Treatment Plant, incineration was used for sludge disposal. Citizens alleged that incinerator test operations caused high blood lead levels in area children; EPA and the County Health Officer could find no evidence of a health hazard. However, a resolution was passed that stopped incineration until some undetermined time when it is proven conclusively that no health hazards exists. The Washington Suburban Sanitary Commission, which controls the Piscataway facility, has millions of dollars invested in the incinerators. In addition, tests for the potential health hazard, ironically, cannot be performed without operating the incinerators and quantitatively measuring their output. It was recommended that the public be involved in planning decisions. The impact of institutional problems will be minimized if the public forms its values and attitudes before disposal methods are in operation. (See also W75-09532) (Prague-FIRL)
W75-09555

ENERGY CONSERVATION AND RECYCLING PROGRAM OF THE METROPOLITAN SEWER BOARD OF THE TWIN CITIES AREA,
Metropolitan Sewer Board, St. Paul, Minn.
For primary bibliographic entry see Field 5D.
W75-09556

SLUDGE DISPOSAL AT A PROFIT,
Barber-Colman Co., Irvine, Calif. Resource Recovery Systems Div.
For primary bibliographic entry see Field 5D.
W75-09557

SLUDGE MANAGEMENT SYSTEM FOR ST. LOUIS,
Saint Louis Metropolitan Sewer District, Mo.
For primary bibliographic entry see Field 5D.
W75-09558

WET AIR OXIDATION OF CHEMICAL SLUDGES,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W75-09565

EVALUATION OF ENVIRONMENTAL IMPACT OF LANDFILLS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W75-09761

SEWAGE DISPOSAL AND WATER SUPPLY ALTERNATIVES ON THE BASIS OF WATER QUALITY AND ECONOMIC CRITERIA,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5B.
W75-09774

5F. Water Treatment and Quality Alteration

IMPLEMENTATION OF WATER SUPPLY AND WASTEWATER PROGRAMS IN THE WASHINGTON, D.C. METROPOLITAN AREA.
American Society of Civil Engineers, Washington, D.C. Water Pollution Task Force.
For primary bibliographic entry see Field 5D.
W75-09392

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,
Butler Univ., Indianapolis, Ind. Holcomb Research Inst.
For primary bibliographic entry see Field 5D.
W75-09408

ANTIMICROBIAL AGENTS FOR WATER CONSERVATION,
Henkel and Cie GmbH, Duesseldorf (West Germany). (assignee)
G. Koppensteiner, H. W. Eckert, and V. Wehle.
US Patent No 3,874,869, 10 p, 9 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 933, No 1, p 290, April 1, 1975.

Descriptors: *Patents, *Water pollution treatment, *Pollution abatement, *Microorganisms, Bacteria, Fungi, Algae, Chemical reactions, *Water treatment.
Identifiers: Sequestering agents.

This invention provides a process for the prevention of the growth of microorganisms in industrial and other service waters such as the water in swimming pools, cooling cycle water, wash water in air conditioning plants. The organisms from the group consisting of gram-positive bacteria, gram-negative bacteria, fungi and algae are contacted with an effective antimicrobial amount of a reaction product of epsilon-caprolactam and an N-alkylalkylene diamine with the reaction being carried out in the liquid phase for 3 to 20 hours at a temperature above 180 deg C. The process further comprises incorporating into the industrial water an effective amount of a sequestering agent comprised of a water-soluble phosphonic acid which forms a complex with a divalent metal, a water-soluble salt of the acid and the mixtures thereof, with the weight ratio of sequestering agent to reaction product being 1:10 to 10:1. (Sinha-OEIS)
W75-09637

DETECTOR OF TRACE SUBSTANCE IN WATER,
Shibata Kagaku Kikai Kogyo Kabushiki, Tokyo (Japan). (assignee)
For primary bibliographic entry see Field 5A.

W75-09655

PORTABLE WATER SUPPLY SYSTEM,
World Water Resources, Inc., New York. (assignee)
For primary bibliographic entry see Field 5D.
W75-09658

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 3. MOUNTAINS AND WESTERN PIEDMONT,
Geological Survey, Raleigh, N.C.
N. M. Jackson, Jr.
North Carolina Department of Natural and Economic Resources, Raleigh, July 1974. 232 p, 4 fig, 7 ref.

Descriptors: *Water supply, *Municipal water, *North Carolina, Water sources, Water quality.

Public water supplies in 24 counties in the mountains and western Piedmont section of North Carolina are described. A map of each county shows the area served by public water supplies. An inventory of each public supply in the county with 500 or more customers gives the population served, the adjacent communities served, the number of metered customers, the source of water, estimated allowable draft, total and industrial water use, raw and finished water storage, raw and finished water-pumping capacity, future plans, a water-resources appraisal in the immediate vicinity of the supply, and the results of chemical analyses of raw and finished water. (Knapp-USGS)
W75-09711

5G. Water Quality Control

AN OPTIMAL WATER QUALITY MANAGEMENT TECHNIQUE FOR CONJUNCTIVE GROUND AND SURFACE WATER USE,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Sciences.
H. M. Hays, J. F. Harp, and J. G. Laguros.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 383, $4.25 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (June 1975). 41 p, 4 fig, 3 tab, 27 ref. OWRT A-055-OKLA(1).

Descriptors: *Optimum development plans, *Regression analysis, Aquifers, Alkalinity, *Groundwater resources, Hardness(Water), *Conjunctive use, Turbidity, Water table, Water wells, *Water quality, Groundwater, Water demand, Municipal water, Reservoir storage, Hydrogen ion concentration, *Oklahoma, Management.
Identifiers: Impoundment water, Norman(Okla).

The objectives were to determine time, season, and antecedent conditions when impoundment and ground water separately reach optimum quality. Further, the project was to compare the quality of these two water supply sources at any given time so as to establish quantified combinations which would give optimum quality. Water quality for the wells was essentially constant, therefore well-water quality parameters, for purposes of this study, were also considered to be constant. The method used to evaluate the data was stepwise regression utilizing the IBM statistical subroutine package. Regression analysis was performed on the data which were divided into the four seasons. The resulting linear equations are multiterm and established correlation between the independent variables, rainfall, lake-level, surface water used, well-water used, and the water quality dependent variables deemed important. The dependent variables are pH, alkalinity, hardness, turbidity, and iron concentration. Only the regression equations of best fit are presented.
W75-09378

A GUIDE FOR STATE CERTIFICATION OF WASTEWATER FACILITIES PERSONNEL,
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-09389

OCEAN WASTE DISPOSAL PRACTICES IN METROPOLITAN AREAS OF CALIFORNIA,
Interstate Electronics Corp., Anaheim, Calif.
For primary bibliographic entry see Field 3D.
W75-09391

CONTROL SCHEMES FOR THE ACTIVATED-SLUDGE PROCESS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09395

WASTEWATER SURVEY, CHANUTE AFB, ILLINOIS.
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5D.
W75-09397

WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.
San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6D.
W75-09400

DISINFECTION OF SOIL STRIPS THROUGH THE DRIP IRRIGATION SYSTEM,
Hebrew Univ., Rehovth (Israel).
M. Uzrad, and S. D. Goldberg.
In: Proceedings of the Second International Drip Irrigation Congress, p 137-141, (1974). 3 tab.

Descriptors: *Disinfection, Management, Crop production, Irrigation systems, Irrigation practices, Irrigation, Agriculture, Water pollution control, Path of pollutants.
Identifiers: *Trickle irrigation, *Drip irrigation, *Israel, *Methyl bromide.

Seasonal crops (vegetables) are often grown on a limited area in the Arava agricultural plots. It is also customary to apply manure of unknown origin. After several seasons of cultivation, there is a marked decrease in the level of the agricultural production and the fields become infested with weeds. Usually soils are disinfected with methyl bromide. Row crops in the Arava desert are irrigated by the drip system, thus the cultivation, fertilization, and irrigation are restricted to the cultivated strip. An experiment was conducted to study the possibility of also applying the disinfectant only to the cultivated strip through the drip system. Hot gaseous methyl bromide was applied through the drip laterals and through the drippers which were covered by plastic mulch. Crop yields for the treated areas were three times greater than in the control plot. (See also W75-09423) (Skogerboe-Colorado State)
W75-09444

IRRIGATION RETURN FLOW AS INFLUENCED BY DRIP IRRIGATION,
New Mexico State Univ., University Park.
T. C. Patterson, and P. J. Wierenga.
In: Proceedings of the Second International Drip Irrigation Congress, p 376-381, (1974). 2 fig, 3 tab, 4 ref.

Descriptors: *Return flow, *Water quality, *Salinity, Surface irrigation, *Saline water, Saline soils, New Mexico, Texas, Irrigation practices, Irrigation systems, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

Deterioration of water quality in the Rio Grande is a major problem for water users in New Mexico and Texas. From near Santa Fe, New Mexico to El Paso, Texas, a distance of 270 miles, the total of dissolved solids increases from 221 ppm to 787 ppm while the percent of sodium increases from .25 near Santa Fe to 52 at El Paso. The deterioration in quality is due to the return of lower quality drainage water from the irrigated areas to the river. This paper describes a project designed to determine, under field conditions, rates of water and salt movement in the soil and subsequently to the drains as affected by frequency and amount of trickle irrigation, as compared to frequency and amount of surface water application. Both return flow quality and quantity are evaluated. (See also W75-09423) (Skogerboe-Colorado State)
W75-09485

WEED CONTROL UNDER DRIP IRRIGATION IN ORCHARD AND VINEYARD CROPS,
For primary bibliographic entry see Field 3F.
W75-09493

EFFECTS OF NITROGEN FERTILIZER APPLICATIONS TO PART OF A ROOT SYSTEM,
Victoria Dept. of Agriculture, Ferntree Gully (Australia).
For primary bibliographic entry see Field 3F.
W75-09496

EVALUATION OF RECOVERY IN A POLLUTED CREEK AFTER INSTALLATION OF NEW SEWAGE TREATMENT PROCEDURES,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 5B.
W75-09515

POLLUTION OF IRRIGATION WATERS BY PLANT PATHOGENIC ORGANISMS,
Nebraska Univ., Lincoln. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5B.
W75-09521

SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W75-09530

IDENTIFICATION OF PROBLEM AREAS IN WATER POLLUTION CONTROL PLANTS,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5D.
W75-09564

OIL SKIMMER WITH OSCILLATABLE CIRCULAR LOOP,
E. L. Brill, and B. M. Brill.
Canadian Patent 963,398. Issued February 25, 1975. Patent Office Record, Vol 103, No 8, p 42, February 1975.

Descriptors: *Oil spills, *Patents, Equipment, Water pollution control, Oil wastes, *Skimming, Separation techniques, Pollution abatement.
Identifiers: *Oil skimmers, Loops.

A device to skim oil which is floating on top of a pool of water is described. The skimmer consists of an endless substantially rigid loop of a uniform cross-section. This loop is gripped at its upper edge by a pair of rolls which rotate in opposite directions and engage the loop at one zone in diagonally opposed quadrants. The rolls rotate the loop in its own plane and cause it to pass continuously in and out of the pool of water or hydrophilic liquid and thus to attract hydrophobic material

such as oil. The oil or any colloidal material is then lifted by a coil and squeezed out as it passes through the rolls. The loop may oscillate about an axis substantially tangential to the loop at the driving zone. (Prague-FIRL)
W75-09568

FINANCIAL INCENTIVES AND POLLUTION CONTROL: A CASE STUDY,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
T. A. Ferrar, A. B. Brownstein, J. D. Simpson, and S. Streiter.
Available from the National Technical Information Service, Springfield, Va. 22161. Environmental Protection Agency, Report EPA-600/5-75-007, April 1975. 51 p, 7 ref. 1HA093 09 AFD 07. EPA Contract 68-01-2250.

Descriptors: *Pollution abatement, Standards, *Air pollution, Northeast US, Alternative planning, Fuels, *Pollution taxes(Charges).
Identifiers: *Financial incentives, *Fuel oil, *Pollution control variances.

Confronted with shortages of low-sulfur content residual fuel oil, several air-pollution-control authorities in the northeastern states were forced to relax air-quality standards during the winters of 1972-73 and 1973-74. The authorities did so by granting variances to their sulfur-content standards for residual fuel oil. The characteristics of these variances are examined. Alternative policies such as direct regulation, fuel-oil surcharges, emission taxes and quantity control are discussed. (EPA)
W75-09574

PROJECTS IN THE INDUSTRIAL POLLUTION CONTROL DIVISION - DECEMBER 1974.
Environmental Protection Agency, Washington, D.C. Industrial Pollution Control Div.
For primary bibliographic entry see Field 5D.
W75-09578

STORM WATER MANAGEMENT MODEL: USER'S MANUAL, VERSION II,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W75-09579

COUNTERMEASURES FOR POLLUTION FROM OVERFLOWS; THE STATE OF THE ART,
Environmental Protection Agency, Edison, New Jersey, Storm and Combined Sewer Section.
For primary bibliographic entry see Field 5D.
W75-09580

STATE-OF-THE-ART FOR THE INORGANIC CHEMICALS INDUSTRY: COMMERCIAL EXPLOSIVES,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W75-09581

RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
Publication No 48, April 1973. 48 p.

Descriptors: *Research priorities, *Water resources, *California, *Water quality control, Methodology, Water rights, Waste disposal, Wells, Disinfection, Recycling, Waste water disposal, Erosion, Silting, Surface waters, Groundwater, Salinity, Eutrophication, Toxicity, Oil, Mine wastes, Water reuse, Legal aspects, Economics, Institutions, Data processing, Water pollution control.

The research program of the California State Water Resources Control Board assigns highest priority to the development of methodology and data for the State Board and the nine regional water quality control boards in their planning and control functions. Currently acute problems and research for permanent solutions to problems are emphasized. Three classes of research priority are established as guidelines for developing research studies. The Priority I topics include methodology and data for analysis of water rights applications, impact of wastes on groundwater, and influence of toxicants and biostimulants on surface waters. Reliable disinfection systems, recycling and use of wastewater solids and reclaimed wastewater, and the control of pollution from irrigated agriculture are also in the priority I group. Additional guidelines are identified relating to funding of research by the Board, literature search requirements, project duration, and proposal evaluation. The following water resources control problems were discussed: erosion and siltation, degradation of groundwaters, increasing salinity of surface waters, eutrophication, toxicity, oil and other hazardous material spills, mine wastes, and geochemical hazards. Water quality monitoring and data are important in control programs. Problems in wastewater treatment, residue processing and disposal, and wastewater reclamation and reuse were described. Legal, economic, and intitutional problems were identified and may be the most difficult to resolve. A detailed description of overall research and development needs in major water resources control subjects was included. (Dawes-ISWS)
W75-09587

HYPOLIMNETIC OXYGENATION USING LIQUID OXYGEN,
Union Carbide Corp., San Francisco, Calif. Aquatic Environmental Sciences.
A. W. Fast, W. J. Overholtz, and R. A. Tubb.
Water Resources Research, Vol 11, No 2, p 294-299, April 1975. 7 fig, 8 ref.

Descriptors: *Ohio, *Oxygenation, *Hypolimnion, *Waste water treatment, *Dissolved oxygen, *Oxygen, Eutrophication, Dissolved oxygen analyzers, Treatment, Zone of aeration, Stratification, Lakes, Thermocline, Water properties, Productivity, Fish, Nutrients, Aquatic life, Aeration, Thermal stratification, Fisheries.
Identifiers: *Side stream pumping, Ottoville Quarry(Ohio).

A new system of hypolimnetic oxygenation called side stream pumping (SSP) was described. The SSP system uses liquid oxygen and a conventional water pump, whereas most other hypolimnetic oxygenation systems use compressed air and a special aeration chamber. The SSP system was tested in Ottoville Quarry, Ottoville, Ohio, during the summer of 1973. Hypolimnetic oxygen concentrations increased from less than 0.5 mg/l to over 8.0 mg/l during 2 months of operation, and thermal stratification was maintained. These improvements created a suitable habitat for cold-water fish, but care must be exercised in the use of the SSP system to avoid potential problems with high, free carbon dioxide concentrations. (Henley-ISWS)
W75-09589

COMPARATIVE ECOLOGY OF WESTERN STREAMS,
Montana Univ., Missoula. Dept. of Zoology.
A. L. Sheldon.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 513, $3.75 in paper copy, $2.25 in microfiche. Research Report No 62, Montana University Joint Water Resources Research Center, Bozeman, March 1975. 29 p, 1 fig, 16 ref. OWRT A-058-MONT(1).

Descriptors: Ecology, Ecosystems, Zoology, *Dominant organisms, Biological communities, Fish, Insects, *Stoneflies, Systematics, *Bioindicators, Water quality.
Identifiers: Biological models, Dominance index, *Diversity index, *Simpson's index, Nymphs.

Two papers are presented. The first is entitled, Dominance and Diversity Measures: Separation of Components, by A. L. Sheldon. Simpson's index of dominance is separable into additive independent components related to species richness and equitability. A test of the method suggests richness to be the only meaningful component. If this is generally true, then the expected number of species in a sample of a given size is recommended as a diversity index. This index includes both richness and evenness aspects of diversity. The second report, The Nymphs of the Genus Zapada (Insecta: Plecoptera) of Western North America, by R. A. Haick, lists the major species of this genus. (Holje-Montana State)
W75-09617

THE EFFECT OF SULFATE AND MANGANESE DIOXIDE ON THE RELEASE OF PHOSPHORUS FROM LAKE MENDOTA SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W75-09619

A CASE STUDY OF ESTUARINE POLLUTION AND LOCAL AGENCY INTERACTIONS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
C. P. Cartee, N. O. Murray, and D. C. Williams, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 516, $3.75 in paper copy, $2.25 in microfiche. Mississippi Water Resources Reseach Institute, Mississippi State, Completion Report, June 1975. 43 p, 3 fig, 23 ref. OWRT A-089-MISS(1).

Descriptors: *Governmental interrelations, Water pollution, Estuaries, *Mississippi, Gulf of Mexico, *Local governments, Water quality standards, *Jurisdiction, Legal aspects, *Administrative agencies.

A case study analysis was made of a specific pollution problem on the Gulf Coast of Mississippi with emphasis on the agency and governmental interface. Numerous personal interviews with representatives of affected political subdivisions and involved agencies were utilized in addition to secondary sources. Much negative reaction was discovered. Indepth interviewing revealed many points of conflict between the enforcement agencies and the affected local units of government. Much misunderstanding centered around procedures used in collecting and testing water samples and the evolution and interpretation of the water quality criteria. Several intricate legal questions were found to characterize the problem with respect to the 26-mile, man-made sand beach, especially with respect to jurisdictional responsibilities in providing public notice of the water's quality. Overall, the study emphasized (1) the importance of input mechanisms and education of local governmental officials relative to the development, evolution and use of pollution standards, and (2) the need for identifying and establishing jurisdictional authority for bodies of water in terms of public pollution notifications when large expanses of beach front are involved.
W75-09620

INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

WATER FOR ENERGY SELF-SUFFICIENCY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

UNDERWATER DRILLING POLLUTION CONTROL CURTAIN,
Sun Oil Co., Dallas, Tex. (assignee)
C. M. Mason.
US Patent No 3,879,951, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 1965, April 29, 1975.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Oil spills, Offshore platforms, Equipment, Well screens, Pollution abatement.
Identifiers: *Pollution control curtains.

A pollution control curtain attached to the sea floor on one end and to a collar floating on the surface of the sea on the other end for positioning around a drilling platform entraps petroleum fluids seeping from the well head or sea floor being serviced by the platform. Fluids are conveyed to the surface within a predefined area from which they can be collected. The body of the curtain can be fabricated from any flexible or rigid material with sufficient strength and resistance to corrosion to serve in a subsurface structure, such as steel plate and cable, plastic, heaving gauge, Neoprene, canvas or combinations of any of these materials. (Sinha-OEIS)
W75-09639

WATER QUALITY ANALYSIS SYSTEM WITH MULTICIRCUIT SINGLE SHELL HEAT EXCHANGER,
E. A. Houser, and B. W. Schwindt.
US Patent No 3,880,226, 7 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 2055, April 29, 1975.

Descriptors: *Patents, *Water quality control, *Electric powerplants, *Heat exchangers, Water analysis, Sampling, Temperature, Cooling water, Power system operation, Equipment.

A modular water quality analysis system for steam electric power generating plants is disclosed which includes a single shell multicircuit heat exchanger having means to individually vary the rate of flow of cooling water through each of the multiple circuits so that the single heat exchanger can simultaneously cool a number of samples entering it at widely differing high inlet temperatures to the same lower range of outlet temperatures. The heat exchanger has a physical construction such that it can be mounted on top of the system rack which contains modules of apparatus for accepting water or steam samples from various test points in the power generating system, reducing the pressure and temperature, directing and metering the flow of samples, and performing analyses for such water characteristic as pH, specific or cation conductivity, dissolved oxygen, sodium content etc. The fact that the single shell heat exchanger can be mounted on top of the system rack makes possible a considerable saving in cost, space and weight, a greater flexibility in system layout design, together with greatly improved access to the system components for adjustment and maintenance purposes, and faster instrument reponse due to shorter sample tubing runs. (Sinha-OEIS)
W75-09642

MATERIAL FOR BIOLOGICAL DEGRADATION OF PETROLEUM,
Dunn (John) Agencies Ltd., Vancouver (British Columbia). (assignee)
For primary bibliographic entry see Field 5D.
W75-09652

COLLECTION AND RECOVERY SYSTEM FOR OIL SPILLS,
Ocean Systems, Inc., Reston, Va. (assignee)
F. A. March, and L. S. Brown.
US Patent No 3,883,433, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 934, No 2, p 739, May 13, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, *Separation techniques, Equipment, Weirs.

The apparatus described performs a substantial separation of the oil from the water before the oil is discharged for delivery to a pick-up station or accompanying vessel and is highly conformable to wave motion so that oil escape is minimized. The discharged oil is in an essentially reclaimed state. The invention features a plurality of rigid weir-plates disposed along a primary weir and supported by discrete weir-plate floats, each weir-plate having a weir opening. The weir-plates are spaced from each other along the primary weir and connected to one another by a flexible sheet, thereby making the primary weir conformable to wave motion. Stiffeners connected between the primary weir and the secondary floats maintain the spacing. A number of secondary weirs are supported on secondary floats, each having a lip positioned beneath its associated secondary float, therby admitting fluid from the upper layer of fluid within the basin to an oil discharge without air entrainment. As the apparatus moves over the body of water there is a thickening of the oil ahead of the weir plate and a reduced pressure beneath the basin. The primary weir may be towed with the preponderance of towing forces carried by a tension line. Bridles proportioned in length deploy the primary weir along a parabolic line. (Sinha-OEIS)
W75-09660

PROCESS FOR SEPARATING LOW API GRAVITY OIL FROM WATER,
Union Oil Co. of California, Brea. (assignee)
V. L. Traylor.
US Patent No 3,884,803, 5 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1184, May 20, 1975.

Descriptors: *Patents, *Oil pollution, *Oily water, *Pollution abatement, *Water pollution control, *Separation techniques, Water pollution control.
Identifiers: Gas flotation, Low gravity oil.

In cases where gravity separation is not sufficient to obtain the water quality desired, gas flotation processes are employed for oil-water separation. However they are not as effective separating low gravity oils, such as oils having API gravities of about 20 deg or lower. Accordingly it is a primary object of this invention to provide a process for separating low API gravity oil from water. A small amount of a high API gravity oil is added to the oil-contaminated water and the misture thereafter is contacted with finely divided gas bubbles to float the oil and included particulate solid matter to the surface for mechanical separation. A low oil-content product water suitable for discharge into public waters or sewer systems, or for use in industrial and agricultural applications is produced. (Sinha-OEIS)
W75-09664

ANTI POLLUTION WATERWAY DEVICE AND PROCESS,
W. Smyrnow.
US Patent No 3,884,810, 5 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1186, May 20, 1975.

Descriptors: *Patents, *Water pollution control, Water quality control, *Pollution abatement, Pollution(Stream), Turbulent flow, Air circulation, Equipment, Bubbles.

The process includes the cleansing of waterway flowing water by directing a gaseous fluid such as compressed air through a submerged conduit extending along a line of flow at an oblique angle to the direction of the flowing water, releasing the compressed air in the form of bubbles all along the extension of the conduit at a plurality of closely arranged points such that an oblique barrier of bubbles is formed obliquely across the direction of flow of water, there being a sufficient amount of bubbles released to form a major up-draft current of water toward the surface. Currents counter to the normal flow of water are created at least sufficiently to temporarily deter the movement of debris and other pollutants but with the downstream flow of the current causing the pollutants to slide obliquely along the oblique barrier in a downstream direction to a collection point which includes a collection means of any desired or conventional type. The system consists of a rigid, elongated member having a weight substantially greater than the water; a conduit; mounting means to fix the elongated member to the bottom surface at an angle from about 15 to 75 deg to the direction of flow; a plurality of air escapement perforations; and pump means providing air at a pressure sufficient to cause a rising plane of turbulence from the conduit to the surface of the waterway. (Sinha-OEIS)
W75-09665

OIL INTERCEPTORS FOR SEPARATING OIL FROM WATER BY GRAVITY,
Shell Oil Co., Houston, Tex. (assignee)
J. Cornelissen.
US Patent No 3,884,815, 4 p, 10 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 934, No 3, p 1188, May 20, 1975.

Descriptors: *Patents, *Oily water, *Oil pollution, *Water pollution control, *Separation techniques, Gravity, Ships, Equipment.
Identifiers: Separator vessel.

The invention is concerned with an oil interceptor of the type which employs one or more packs of closely-spaced inclined plates between which an oil-water mixture is passed. As the mixture flows downward between the plates under laminar flow conditions, the lighter-than-water oil globules rise and collect under the under surface of each plate and the heavier sludge and sediment settle out on the upper surface of each plate. The oil globules coalesce and rise free of the plate pack and the sludge settles to the bottom of the interceptor vessel containing the plate pack. The object of this invention is to adapt this type of interceptor for use on board ship for cleaning ballast and tank-cleaning water of tankers. The oil interceptor or separator vessel has an outlet oil line with an outlet oil weir and an outlet water line with an outlet water weir. The weirs are mounted adjacent one another and at a position above the main part of the separator vessel, the edge of the oil weir being at a higher level than the edge of the water weir. When the separator vessel is mounted on board a ship, at least the weirs are oriented whereby the edges of the weirs lie in substantially a port-starboard direction. (Sinha-OEIS)
W75-09667

THE BOTTOM FAUNA OF CHINA CLAY WASTE DEPOSITS IN MEVAGISSEY BAY,
Otago Univ., Portobello (New Zealand). Marine Biological Station.
For primary bibliographic entry see Field 5C.
W75-09673

WATER-RESOURCES INVESTIGATIONS IN THE FORT UNION COAL REGION, NORTH DAKOTA, 1974-75.
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 5B.

W75-09715

ATTITUDES IN SLUDGE TREATMENT AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-09731

A CASE STUDY OF MINE WATER QUALITY DETERIORATION, MAINSFORTH COLLIERY, COUNTY DURHAM,
Teesside Polytechnic, Middlesbrough (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 5B.
W75-09752

MAKEUP REQUIREMENTS FOR COOLING PONDS,
Hanford Engineering Development Lab., Richland, Wash.
J. C. Sonnichsen, Jr.
Journal of the Environmental Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No EE1, Paper 11114, p 15-25, February 1975. 3 tab, 10 ref, 3 append.

Descriptors: *Cooling water, *Water utilization, *Ponds, *Environmental engineering, Water requirements, Reservoirs, Artificial lakes, Thermal powerplants, Consumptive use, *Thermal pollution, Heated water, Evaporation, Water temperature.

The United State's demand for electricity has doubled every 10 years for the last few decades. At present, the rate of growth is even greater. Expert opinion suggests that this trend will continue for the next 20 years. Assuming this is true, the number of kilowatt-hours produced annually will quadruple over this same time span. In the future, power plants will rely more heavily on closed evaporative cooling systems. Water makeup requirements for operating power plant cooling ponds was further reviewed. Water loss was first defined and then computed in terms of the type and size of pond. A distinction between using a natural or man-made pond was drawn. For natural ponds, this flux was considered part of the total natural flux. Results suggested that water loss is dependent on the type as well as the size of pond employed. Computed water makeup requirements for man-made and natural cooling ponds with mixed flow or slug flow were tabulated for three different hydrologic regions of the United States: (1) arid, (2) where precipitation approximately balances natural evaporation, and (3) where precipitation exceeds natural evaporation. Mathematical models used for completely mixed ponds, slug flow ponds, and evaporation were given in an appendix. (Humphreys-ISWS)
W75-09760

DEOXYGENATION IN NATURAL STREAMS,
Nebraska Natural Resources Commission, Lincoln. Data Bank.
For primary bibliographic entry see Field 5B.
W75-09767

RESERVOIR OPTIMIZATION FOR WATER QUALITY CONTROL,
Pennsylvania Univ., Philadelphia.
E. Kaplan.
Available from University Microfilm, Inc., Ann Arbor, Michigan, 48106, Order No 74-22859. PhD Thesis, 1974, 585 p.

Descriptors: *Algorithms, *Water quality control, *Reservoirs, Lakes, Water quality standards, Biochemical oxygen demand, Phosphates, Nitrates, Discharge(Water), Flood control, *Optimization, Hydrogen ion concentration, Dissolved oxygen, Dissolved solid.
Identifiers: Fecal coliforms.

A constrained nonlinear optimization algorithm (COMET) and a program to simulate lake ecology (LAKECO) are used to control both the quantity and the quality of water within and discharged from a reservoir. A multiparameter water quality index was used as an objective function for optimization. Quality parameters included temperature, dissolved oxygen, 5-day BOD, pH, total dissolved solids, phosphates, nitrates, and fecal coliforms. Reservoir elevation and discharge quantity also were considered. An application was given for a proposed reservoir where it was found that stringent design and legal requirements could be met for epilimnetic and discharged water during the period of simulation. The technique can also be used to provide both water quality and flood control capabilities to existing reservoirs capable of selective withdrawal. (Prague-FIRL)
W75-09773

MODIFICATIONS TO THE EXECUTIVE COMPUTER PROGRAM FOR STEADY-STATE SIMULATION OF WASTEWATER TREATMENT FACILITIES,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09775

GYPSUM CAN IMPROVE YOUR WATER ALSO,
Central Soil Salinity Research Inst., Karnal (India).
R. C. Sharma, and I. P. Abrol.
Indian Farming, Vol 23, No 6, p 21-22, September 1973. 1 tab.

Descriptors: *Gypsum, *Irrigation, *Water quality control, *Groundwater, *Arid lands, *Irrigation water, Sodium, Carbonates, Bicarbonates, Calcium, Application methods.
Identifiers: India.

In arid and semiarid areas where surface water supplies are inadequate, it has been necessary to explore for sub-soil water for agricultural use. Complaints are often received from farmers about the low quality water obtained from tubewells. For successful agriculture, it is necessary to have good quality water for irrigation, or take measures to improve the water quality if it is poor. The main problem is generally one of excess sodium and carbonate or bicarbonate. Their effects can be rectified by adding soluble calcium to the water or soil which is being irrigated. The amount of gypsum needed will depend on the water quality which can be tested at the nearest soil testing laboratory. If the electrical conductivity of water is less than 4000 micromhos/cm and the water contains residual sodium carbonate, gypsum is needed. Gypsum can be applied either to the water or to the soil directly; the application will have to be repeated every year or alternate years depending upon the improvement obtained. (Mastic-Arizona)
W75-09787

MAINTENANCE OF THE FEDERAL NAVIGATION PROJECT IN SCARBORO RIVER AT SCARBORO, MAINE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09811

PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 2, POTENTIAL ENVIRONMENTAL IMPACTS, ETC. (ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Land Management, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-MS-73-1651-F-2, $7.50 in paper copy, $2.25 in microfiche. October 18, 1973. 242 p, 7 fig, 13 tab.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Gulf of Mexico, Alabama, Mississippi, Continental shelf, Florida, Oil industry, Oil wastes, Environmental effects, Shoreline cover, Shore protection, Shores, Gulfs, Marine biology, Estuaries, Wetlands, Fishing, Navigation, Ships, Military aspects, Recreation, Aesthetics, Pipelines.
Identifiers: *Environmental Impact Statements, Energy crisis, Oil Pollution Act.

This second volume of the outer continental shelf oil and gas general lease sale, offshore Mississippi, Alabama and Florida environmental impact statement is addressed to the probable environmental impacts of the project and potential mitigating measures. The following environmental impacts were considered: impacts on the living components of the environment (open gulf, marine life, shoreline, estuaries, and wetlands); impacts on air and water quality; impacts on commercial fishing; conflicts with military uses of the continental shelf; conflicts with ship traffic and navigation; and impacts on the recreational, historical, aesthetic and archaeological features of the area. Potential mitigating measures include oil spill regulations, enforcement and contingency action, and construction of protective structures and pipelines. The unavoidable adverse environmental effects of the project were also described. (Gagliardi-Florida)
W75-09820

PROPOSED NAVIGATIONAL MAINTENANCE DREDGING PROJECT AT GUILFORD HARBOR, GUILFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09821

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATERS ALONG THE LOUISIANA COAST (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
Available from the National Technical Information Service, Springfield, Va 22161, USDC, as EIS-LA-73-1897-F, $10.50 in paper copy, $2.25 in microfiche. December 6, 1973. 403 p, 3 map, 4 tab.

Descriptors: *Permits, *Dredging, *Waste disposal, Navigation, Navigable waters, *Louisiana, Turbidity, Oil, Gasoline, Mineralogy, Environment, Fishing, Archaeology, Environmental effects, Fish, Navigation, Salinity, Marshes, Ecosystems, Disposal, Brines.
Identifiers: *Environmental Impact Statements.

The action involves the determination or acceptability of any request for a permit to erect or construct facilities to explore for oil or gas or to develop production and storage of such resources or other mineral resources in navigable waterways. The permit system provides for the orderly and efficient development of the mineral resources of the coast of Louisiana with due regard for minimization of the impact upon the environment. Dredging, spoiling and waste disposal, incident to proposals for which permits are granted, can reduce or expand aquatic and land habitats, alter hydrologic characteristics of areas, create turbidity and cause siltation, and expose, damage, or conceal archaeological sites. Regulation and surveillance systems now employed as well as improved industry awareness and cooperation are expected to minimize these and other impacts. The following adverse environmental effects will result: creation of obstruction to navigation and fishing activities; altered salinity and circulation of marsh areas; possible damage to ecosystems; dredging; and disposal of brines and

sanitary wastes. Alternatives are to cease issuing drilling, structural or dredging permits or to delay development of resources until all environmental problems have been resolved to the satisfaction of all concerned. (Gagliardi-Florida)
W75-09823

BOROUGH OF MORRISVILLE V. DELAWARE RIVER BASIN COMM'N. (RULING ON MOTION TO DISMISS ACTION BY COMMUNITIES DEPENDENT ON DELAWARE RIVER BASIN COMM'N. WHICH ACTION WAS FOUNDED ON A NEPA COMPLAINT).
For primary bibliographic entry see Field 6E.
W75-09827

JOINT CANADA-UNITED STATES MARINE POLLUTION CONTINGENCY PLAN FOR SPILLS OF OIL AND OTHER NOXIOUS SUBSTANCES.
Coast Guard, Washington, D.C.
Available from National Technical Information Service, Springfield, Va 22161 as AD-782 895, $4.25 in paper copy, $2.25 in microfiche. June 20, 1974. 60 p, 8 fig, 3 tab.

Descriptors: *Pollutants, *Pollution abatement, *Oil pollution, Oil industry, Oil spills, Oil wastes, Oil, State governments, Federal government, United States, Canada, Regional development.
Identifiers: International agreements.

The purpose of the plan is to provide for coordinated and integrated responses to pollution incidents by federal, state, provincial and regional plans of both the United States and Canada. The objectives of the plan are to develop appropriate measures of preparedness and systems for the discovery and reporting of pollution incidents, to institute prompt measures to restrict the further spread of oil or other noxious substances, and to provide adequate resources to respond to a pollution incident. The plan provides for pre-designated on-scene commanders and deputy commanders who will coordinate the response activities to control a spill and for joint response teams to provide advice and assistance to the on-scene commanders. Additionally, it establishes alerting and notification procedures, command structures, post-clean-up requirements and arrangements for assuming the responsibility for the cost of operation. The implementation and maintenance of the plan is the joint responsibility of the United States Coast Guard and Department of Transportation and the Canadian Marine Transportation Administration and Ministry of Transport. (Gagliardi-Florida)
W75-09835

OFFSHORE OIL AND GAS RIGHTS: A COMPARATIVE STUDY,
For primary bibliographic entry see Field 6E.
W75-09836

CONTEMPORARY RESEARCH IN MARINE AFFAIRS,
Delaware Univ., Newark. Center for the Study of Marine Policy.
For primary bibliographic entry see Field 6B.
W75-09837

THE RESERVE MINING CASE: PROMISES, PROMISES,
Minnesota Pollution Control Agency, Minneapolis.
G. J. Merritt.
Great Lakes Focus on Water Quality, Vol 1, No 1, p 1-3, Fall 1974.

Descriptors: *Environmental control, *Environmental effects, *Lake Superior, *Air pollution, *Water pollution, Environment, Air, Air pollution effects, Water pollution control, Water pollution effects, Water pollution sources, Waste disposal, Wastes, Water, Asbestos, International Joint Commission.
Identifiers: *Hazardous substances(Pollution), Injunctive relief.

The difficulties and possible futilities inherent in the environmental movement are manifested by the case of Reserve Mining Company and its discharge of 67,000 tons a day of taconite tailings into Lake Superior. On April 20, 1974, Federal District Judge Miles Lord ordered the plant to cease its discharges into the air and water effective 12:01 a.m., April 21, 1974. Less than 48 hours later, it was ordered reopened by a hastily convened panel of 8th U.S. Circuit Court of Appeals judges. Nevertheless, it now appears certain that Reserve is going to have to recognize its public responsibility and end its dumping of waste materials, including possibly carcinogenic asbestos fibers, into the public air and water. The question still remains, however, when the dumping will eventually cease. Despite action by the Environmental Protection Agency and the International Joint Commission, admissions by Reserve officers that permit conditions have not been followed, and fears of cancer causation, the Supreme Court, on June 10, 1974, refused to overturn the 8th Circuit's stay. Corporate irresponsibility and refusal to accept blame is criticized. Only an enlightened public outcry will result in the cessation of this willful and dangerous pollution. (Gagliardi-Florida)
W75-09838

CONSERVATION COUNCIL OF NORTH CAROLINA V. COSTANZO (ACTION TO ENJOIN CONSTRUCTION OF A MARINA ON ISLAND IN ATLANTIC OCEAN AND TO REQUIRE ENVIRONMENTAL IMPACT STATEMENT BY CORPS OF ENGINEERS).
For primary bibliographic entry see Field 6E.
W75-09840

WATER STRATEGY--STATEMENT OF POLICY FOR IMPLEMENTING CERTAIN REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS.
Environmental Protection Agency, Washington, D.C.
April 30, 1973. 74 p, 5 tab, 4 append.

Descriptors: *Federal Water Pollution Control Act, *Effluents, *Water pollution, *Water quality control, Federal project policy, Administration, Governmental interrelations, Long-term planning, Legislation, Coordination, Water policy, Permits, Discharge(Water), Pollution abatement, Estuaries, Sea water, Groundwater, States, Municipal wastes, Industrial wastes.
Identifiers: Effluent limitations, Federal Water Pollution Control Act Amendments of 1972, Inland surface waters, Point sources, Ocean dumping, Non-point sources.

An outline is presented of part of a management system conceived to implement the Federal Water Pollution Control Act Amendments (FWPCA) of 1972. The purpose is to provide the Environmental Protection Agency (EPA) and the states with a presentation of national objectives and relative areas of emphasis. The basic concern dealt with by the FWPCA Amendments is the control of point source pollution to achieve national water quality. This will be accomplished by the institution of a universal base level of effluent limitation supplemented by a higher level of effluent limitations dictated by water quality requirements. The current water quality problem in inland surface waters and estuaries, marine waters and ground water is discussed. Because the major sources of pollution and the level of effluent control needed differs by geographical area and because of budgetary constraints, the strategy is basically to attack water pollution in the areas where it is most serious and where it results principally from the discharges of point sources. The program is principally concerned with industrial and municipal discharges, ocean dumping and non-point sources. Future goals for the EPA and the states are presented, such as establishment by the states of the necessary water quality analysis procedures. (Altuve-Florida)
W75-09841

ENVIRONMENTAL CRITIQUE (THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PROBLEMS AND PROSPECTS AFTER ONE YEAR),
Natural Resources Defense Council, Washington, D.C.
J. G. Speth.
Natural Resource Lawyer, Vol 7, No 2, p 249-256, 1974. 17 ref.

Descriptors: *Federal Water Pollution Control Act, *Water pollution, *Wastes, Regulation, Control, Legal aspects, Institutional constraints, Pollutants, Navigable waters, Social values, Water quality, Law enforcement, Toxins, Scheduling, Planning, Timing, Research and development, Technology, Permits, Federal government, Government finance, Programs.
Identifiers: Point sources, Non-point sources, Impoundment(Funds).

The 1972 Amendments to the Federal Water Pollution Control Act have created a strong but workable regulatory program. The key goal of the Amendments is to restore and maintain the chemical, physical and biological integrity of the Nation's waters. This is to be achieved through implementation of six national policies stated in the Act; one of which is the elimination of the discharge of pollutants into the navigable waters by 1985. Other goals include swimmable and fishable water by 1983 and the speedy elimination of toxic discharges. The Amendments also include a regulatory program to implement the new national policies. The emphasis is upon a reasonable time table for implementation by means of the best practicable technology currently available. Implementation has been delayed by low federal funding and impoundment of funds. Environmentalists are disappointed with the Environmental Protection Agency's failure to publish a satisfactory list of toxic pollutants, its failure to totally control non-industrial point sources, and failure to issue needed guidelines. (Altuve-Florida)
W75-09844

FEDERAL MARITIME JURISDICTION AND STATE MARINE POLLUTION LEGISLATION: THE FLORIDA ACT NOT PREEMPTED PER SE,
Miami Univ., Fla. School of Law.
G. L. Adelman.
University of Miami Law Review, Vol 28, p 209-218, 1973. 69 ref.

Descriptors: *Oil spills, *Oil pollution, *Federal Water Pollution Control Act, Oil, Oil industry, Oil wastes, Pollution abatement, United States, Florida, Pollutants, Water, Water pollution, Water pollution control, Water pollution treatment, Water pollution sources, Water policy, Water quality, Water quality control, Navigable waters, Ships.
Identifiers: Absolute liability, Coastal waters, Hazardous substances(Pollution), Injunctive relief.

A three-judge federal district court for the Middle District of Florida enjoined the enforcement and operation of the Florida Oil Spill Prevention and Pollution Control Act, declaring it null and void as an intrusion into the exclusive federal domain of substantive maritime legislation. The Supreme Court unanimously revised, finding no federal preemption and no direct conflict between the Florida act and the Federal Water Quality Im-

provement Act (WQIA) of 1970. The Court found that the latter act neither touched the subject of the liability of a maritime oil polluter for injuries to property, nor contained any provisions for the recovery by a state of costs it might incur in the abatement and cleanup of oil discharged into the navigable waters of the United States. The Court acknowledged that a state may constitutionally exercise its police power respecting maritime activities concurrently with the federal government and legislate with respect to damages or injuries caused by a vessel on navigable waters, but consummated on land. Questions which might arise in the future concerning the Florida Act involve the effect of the limited liability provisions of the WQIA and of case law prohibiting state legislation which prejudices the characteristic feature of maritime law. (Gagliardi-Florida)
W75-09845

INTERNATIONAL LAW AND CANADIAN ARCTIC POLLUTION CONTROL,
J. J. Sherrin.
Albany Law Review, Vol 38, p 921-942, 1974. 130 ref.

Descriptors: *Canada, *Arctic, *Water pollution, *Water pollution control, Ice, Land, International law, Water pollution effects, Water pollution sources, Pollutants, Water quality, Water quality control, Water resources, Natural resources, Islands, Navigation, Ecology, International waters, Coasts, Oceans, Ships.
Identifiers: Coastal waters, Contiguous zone, International agreements, State policy.

On June 26, 1970, the Canadian Parliament passed the Arctic Water Pollution Prevention Act. The act is designed to ensure that the natural resources of the Canadian Arctic are developed and exploited and the Arctic waters adjacent to the mainland and islands of the Canadian Arctic are navigated in a manner cognizant of Canada's responsibility for the welfare of the Eskimo and other inhabitants of the Canadian Arctic. The scope of the act is quite broad and the penalties provided are stringent and far-reaching. Canada's reasons for choosing to act unilaterally on this matter, rather than awaiting international action, appear to be an increasing disillusionment and frustration with international processes. The act seems to be based upon a far-reaching contiguous zone theory and not on the theory that such waters are subject to Canadian sovereignty. The Act is attacked on two grounds: (1) that the requisite coastal state jurisdiction on the high seas does not exist, and (2) that the means of regulation chosen are inconsistent with international standards concerning passage of ships and freedom of the seas. As long as the Canadian government continues to meet acceptable standards of international administrative due process, the act will remain a legitimate exercise of jurisdiction into the high seas. (Gagliardi-Florida)
W75-09846

ENVIRONMENTAL PROTECTION BY COASTAL STATES: THE PARADIGM FROM MARINE TRANSPORT OF PETROLEUM,
Fordham Univ., Bronx, N.Y. School of Law.
J. C. Sweeney.
Georgia Journal of International and Comparative Law, Vol 4, No 2, p 278-306, 1974. 129 ref.

Descriptors: *International law, *Oil, *Oil pollution, *Oil spills, Environment, Environmental control, Sea water, International commissions, Coasts, International waters, Environmental effects, Navigation, Pollutants, Water, Oceans, Sewage, Drainage, Rivers, Rainfall, Industries.
Identifiers: Energy crisis, International agreements, Territorial seas(Jurisdiction), Territorial waters.

The principle of freedom of the high seas enunciated by Grotius is the theoretical foundation for the denial to any state, other than the state of the vessel's flag, of the right to interfere with the operations of a vessel on the high seas. However, the effect of the principle of absolute freedom of the high seas when applied to the problem of oil pollution of the oceans is either archaic or misleading. Although world order prefers a multilateral solution to the environmental problems caused by oil pollution, nevertheless the same world order will not condemn unilateral solutions which have the necessary effect of extending coastal state interference with navigation and trade on the high seas. It is believed that an emerging rule of international law permits endangered coastal states to take action to interfere with the operations of polluting vessels outside of territorial water. Although there are many sources of environmental damage to the oceans and the coastal zone, such as sewage, natural drainage, river systems and even rainfall, there is one source which is controllable--the ocean transport of petroleum. Unfortunately, the efforts to control this source can imperil one of the most important industries of industrialized economies. Therefore, the slow process of accommodation will be necessary to reach a viable solution. In the interim, in the interest of international uniformity and the progressive development of international law, the 1969 Civil Liability Convention and the 1971 Fund Convention should be ratified by the United States Congress. (Gagliardi-Florida)
W75-09848

MARINE OIL SPILLS: A PROBLEM IN ENVIRONMENTAL MANAGEMENT,
British Columbia Univ., Vancouver. Dept. of Economics.
P. G. Bradley.
Natural Resources Journal, Vol 14, p 337-359, 1974. 5 fig, 3 tab, 27 ref.

Descriptors: *Oil spills, *Water pollution, *Cost-benefit analysis, *Social values, Economic feasibility, Decision making, Economic efficiency, Planning, Cost analysis, Social needs, Regulation, Control, Penalties(Legal), Pollution abatement, Water pollution control, Administration, Programs, Law enforcement, Priorities, Institutional constraints, Oceans, Public benefits.
Identifiers: *Marine oil spills.

Marine oil spills, especially those occurring in connection with ocean transport of petroleum and offshore production, have attracted attention recently from various fields including politics, science, and law. Economics of the spill problem is discussed, focusing on the range of opportunities open to the industry for reducing spillage and incentives to encourage such measures. The problem can be attacked by reducing accidents that cause the spill and by reducing the spillage after occurrence of accidents. The presence of social values and costs in this problem makes it difficult to determine what economic cost should be borne to eliminate oil spills. One proposed solution has been the use of private tort actions. Private actions can serve a useful function but the ultimate solution will have to come after a serious weighing of social and economic costs and benefits. The establishment of a tribunal which would set environmental quality targets and an enforcement agency which would see those targets are reached in an efficient way are a proposed solution. (Altuve-Florida)
W75-09849

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE OPTIMUM DISTRIBUTION OF URBAN WATER SUPPLIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 4A.
W75-09377

DYNAMIC PROGRAMMING OPTIMIZATION: A WATER DISTRIBUTION SYSTEM DESIGN,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 7C.
W75-09525

SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W75-09530

GOUNDWATER MODELS,
For primary bibliographic entry see Field 2F.
W75-09582

REGIONAL ANALYSES OF RUNOFF CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2A.
W75-09621

INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
A. O. Esogbue, B. W. Lin, and O. Coskunogl.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 518, $7.50 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No ERC-0675, June 1975. 231 p, 38 tab, 20 fig, 87 ref, 5 append. B-093-GA(1), B-094-GA(1), B-073-NC(2)-B-062-VA(1), 14-31-0001-4152.

Descriptors: *Systems analysis, Land management, Optimum development plans, *Institutions, Management, Administration, Water quality control, Flood control, Water supply, Urban drainage, Drainage systems, Governmental interrelations, Cost-benefit analysis, *Water management(Applied), Coordination, *Georgia, Planning, *Alternative water use.
Identifiers: *Urban water management, *Atlanta(Geo), *Multiple-objective planning, Communications barriers.

Very complex systems are required for urban water supply, drainage, and water quality control and yet urban water management practice is characterized by little use of modern tools for system design and operation. As an example, land use changes have a major effect on both water needs and water availability, and public goals are not being achieved because basic known systems concepts are not being used to understand, anticipate, or deal with them. In order to probe the barriers between developed analytic tools and practical planning applications, questionnaires were mailed to 60 persons with water or land resource planning and management responsibility in metropolitan Atlanta, Georgia. The responses were used to develop profiles that showed the various groups to possess basically the same training and experience except for the more technical functions of their particular agency; and yet the major problem identified was the need for better communications among managers of impacting land and water subsystems. Regular staff meetings and an activity reporting system were recommended. A method was proposed for ranking alternatives by a matrix in which goals would be weighted by Delphi Techniques. Available techniques for analyzing a number of design and operation problems relating to water quality con-

trol, floodplain management, water supply and stormwater management are tabulated and referenced. (Jones-Geo Tech)
W75-09622

MATHEMATICAL MODELS IN HYDROLOGY,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W75-09624

FEDERAL MARITIME JURISDICTION AND STATE MARINE POLLUTION LEGISLATION: THE FLORIDA ACT NOT PREEMPTED PER SE,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 5G.
W75-09845

6B. Evaluation Process

ECONOMICS AND FINANCE OF NEVADA PUBLIC WATER SYSTEMS,
Nevada Univ., Reno. Desert Research Inst.
B. V. Dall, and H. H. Chen.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 380, $4.75 in paper copy, $2.25 in microfiche. Nevada Center for Water Resources Research, Project Report No 34, May 1975. 81 p, 7 fig, 16 tab, 21 ref, 3 append. OWRT B-068-NEV(1). 14-31-0001-4104.

Descriptors: Water resources development, *Nevada, *Water supply, Management, *Rural areas, *Costs, *Water demand, *Water utilization, Coordination, Institutional constraints, Economics, Finance.

This study was initiated in response to a growing awareness of serious water management problems in rural communities of Nevada. Many small Nevada towns have stable populations and are faced with deteriorating water systems, rising costs for maintenance and investments, and an inadequate population base to support renovations. The major tasks of this study were to assess conditions of the water systems in the study area by compiling a comprehensive data base of water demand, usages, supply, and costs. Most all small communities and their water supply systems were not self-sufficient, discourage proper investment, and do not try and reduce consumption. The major problem prevalent in small communities in Nevada is the serious lack of coordination between institutional structures and community needs. An overall lack of cooperation between communities in regard to water problems and water system construction further hinders any progressive action within the state. (Fallon-Nevada)
W75-09375

MINNESOTA'S WATER RESOURCES: A PRIMER,
Minnesota Univ., St. Paul. Water Resources Research Center.
W. C. Walton.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 500, $3.75 in paper copy, $2.25 in microfiche. Public Report Series Number 2, May 1975. 33 p, 40 fig, 7 ref. OWRT A-999-MINN(36). 14-31-0001-5023.

Descriptors: *Minnesota, Planning, Water policy, *Water resources, Information exchange, Water availability, *Programs.
Identifiers: *Water resources problems, Public understanding.

A digest (primer) is presented of available information concerning Minnesota's water resources in layman's language. Generalization and brevity are emphasized. Although Minnesota does not have an overall water shortage, in 1974, there were serious and undesirable water resources problems. Basic facts concerning the availability of water, nature of problems, and kinds of programs to solve problems are presented. (Waelti-Minnesota)
W75-09516

SECTORAL AND REGIONAL ECONOMIC IMPACT OF CONTROLLING NONPOINT POLLUTION IN FORESTED AREAS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W75-09530

ARIZONA'S REMOTE SUBDIVISIONS: AN INVENTORY,
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 6G.
W75-09583

STATE OF ARIZONA, ENVIRONMENTAL SERVICES NEEDS STUDY FOR GREENLEE COUNTY, 1970-1990.
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
For primary bibliographic entry see Field 5D.
W75-09584

RESEARCH NEEDS FOR WATER RESOURCES CONTROL IN CALIFORNIA.
California State Water Resources Control Board, Sacramento. Div. of Planning and Research.
For primary bibliographic entry see Field 5G.
W75-09587

SURFACE WATER RESOURCES OF ST. JOHNS RIVER, FLORIDA,
Reynolds, Smith and Hills, Jacksonville, Fla.
For primary bibliographic entry see Field 2A.
W75-09604

ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-09615

INTEGRATIVE PROCEDURES FOR COORDINATED URBAN LAND AND WATER MANAGEMENT: A SYSTEMS ANALYSIS,
Georgia Inst. of Tech., Atlanta. School of Industrial and Systems Engineering.
For primary bibliographic entry see Field 6A.
W75-09622

WATER FOR ENERGY SELF-SUFFICIENCY.
Water Resources Council, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 Price $2.70. October, 1974. 184 p, 31 tab.

Descriptors: *Comprehensive planning, *Institutional constraints, *Energy, *Hydroelectric power, *Water distribution(Applied), Water supply, *Water supply development, *Water quality, Colorado River Basin, Mississippi River, Power system operation, Water delivery, Water cooling, North America, Power plants, Planning, Arid lands, Semiarid climates, Decision making, Financing.

Recommendations are provided for a course of action to meet the energy-related water needs of the U.S. Projects, programs, and investigations are identified which can assist in meeting water requirements for needed energy development, not maximum development. Emphasis is on the availability of water supplies for exploration, extraction, processing, transporting and use of energy; generating hydroelectric power; domestic and industrial needs; and associated needs arising from new energy related developments. Analysis was done on a regional basis and potential actions are suggested to alleviate identified problems. Activities included solicitation, study, and consideration of state information and views on energy related goals, projects, priorities, and problems associated with water for energy development. (See also W75-09627) (Bowden-Arizona)
W75-09626

WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

CONTEMPORARY RESEARCH IN MARINE AFFAIRS,
Delaware Univ., Newark. Center for the Study of Marine Policy.
G. J. Mangone, and J. L. Pedrick, Jr.
Available from National Technical Information Service, Springfield, Va 22161 as COM-74-11559, $4.25 in paper copy, $2.25 in microfiche. July 1974. 58 p, 103 ref.

Descriptors: *Research and development, *Marine biology, Oceans, State governments, Mineralogy, Fisheries, Fish, Fishing, Research facilities, Research priorities, United States, Pollution abatement, Pollutants, Pollutant identification, Coasts, International law.
Identifiers: International agreements.

Various methods of research in marine affairs that are currently being undertaken in the United States are described. A substantial list is presented of principal researchers as a review of achievements and needs in this fast-moving field of study. The areas of marine affairs research are classified as national security policy, merchant marine and port policy, mineral policy, fisheries policy, pollution policy, and coastal zone and general policy issues. It id essential to the wise guidance of public policy for the coastal zone, the seabed, and the oceans that such research be maintained, and broadened to the point of decision-making at state, federal, and international levels. Compared to the investment of resources in marine sciences, research in marine affairs is infinitesimal. Yet the rewards for public welfare through well-informed policies as a result of marine affairs research can be enormous. (Gagliardi-Florida)
W75-09837

FEDERAL MARITIME JURISDICTION AND STATE MARINE POLLUTION LEGISLATION: THE FLORIDA ACT NOT PREEMPTED PER SE,
Miami Univ., Fla. School of Law.
For primary bibliographic entry see Field 5G.
W75-09845

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMICS AND FINANCE OF NEVADA PUBLIC WATER SYSTEMS,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 6B.
W75-09375

AN INVESTIGATION OF FACTORS AFFECTING THE INTENSITY OF WATER USE IN THE LAJAS VALLEY IRRIGATION PROJECT,
Puerto Rico Univ., Mayaguez. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W75-09376

EVALUATION OF MUNICIPAL SEWAGE TREATMENT ALTERNATIVES.
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-09404

ECONOMIC ANALYSIS OF THE PROCESSING AND DISPOSAL OF REFUSE SLUDGES,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09406

THE ECONOMICS OF SLUDGE IRRIGATION,
Springfield Sanitary District, Ill.
For primary bibliographic entry see Field 5D.
W75-09545

FINANCIAL INCENTIVES AND POLLUTION CONTROL: A CASE STUDY,
Pennsylvania State Univ., University Park. Center for the Study of Environmental Policy.
For primary bibliographic entry see Field 5G.
W75-09574

BUSHLEY BAYOU, LOUISANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W75-09819

6D. Water Demand

AN INVESTIGATION OF FACTORS AFFECTING THE INTENSITY OF WATER USE IN THE LAJAS VALLEY IRRIGATION PROJECT,
Puerto Rico Univ., Mayaguez. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W75-09376

WATER, SEWERAGE AND FLOOD CONTROL SYSTEMS PLAN AND IMPLEMENTATION PROGRAM 1973-74.
San Diego County Comprehensive Planning Organization, Calif.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 409, $4.25 in paper copy, $2.25 in microfiche. Prepared for Dept. of Housing and Urban Development, December, 1973. 61 p, 4 tab.

Descriptors: *Comprehensive planning, *Waste water treatment, *Sewerage, *Flood control, *Local governments, Facilities, Sewage treatment, Planning, Water resources development, Water utilization, *California.
Identifiers: *San Diego region(Calif).

Goals and policies are presented for the provision, planning, and extension of water, sewerage, and flood control facilities and services in the San Diego region of California. A summary of an evaluation of the adequacy of the existing facilities to meet present and projected 1981 requirements and a list of proposed projects which are partly based on this evaluation are also presented. The introduction explains San Diego County and the Comprehensive Planning Organization; part 2 sets forth the goals and policies to guide the planning and development of water, sewerage and flood control facilities; part 3 discusses the adequacy of the water resources and existing water resource facilities in the region; part 4 outlines improvements as well as financial considerations, and, part 5 discusses the implementation of the systems in relation to governmental responsibilities and organization. (Orr-FIRL)
W75-09400

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 3. MOUNTAINS AND WESTERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 5F.
W75-09711

MAKEUP REQUIREMENTS FOR COOLING PONDS,
Hanford Engineering Development Lab., Richland, Wash.
For primary bibliographic entry see Field 5G.
W75-09760

6E. Water Law and Institutions

A GUIDE FOR STATE CERTIFICATION OF WASTEWATER FACILITIES PERSONNEL,
Water Pollution Control Federation, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-09389

OCEAN DISPOSAL EXPERIENCES IN PHILADELPHIA,
Philadelphia Water Dept., Pa.
For primary bibliographic entry see Field 5E.
W75-09550

A CASE STUDY OF ESTUARINE POLLUTION AND LOCAL AGENCY INTERACTIONS,
University of Southern Mississippi, Hattiesburg. Bureau of Business Research.
For primary bibliographic entry see Field 5G.
W75-09620

WATER LAWS IN MOSLEM COUNTRIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
D. A. Caponera.
Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 20/1, 1973. 223 p, 118 refs.

Descriptors: *Water resources, *Water law, *Legislation, *Water rights, Legal aspects, Water resources development, Arid lands, Asia, Africa, Irrigation, *Reviews.
Identifiers: *Moslem water law, Afghanistan, Bahrain, Brunei, Iran, Jordan, Kuwait, Morocco, Qatar, Somalia, Tunisia, The Peoples' Democratic Republic of Yemen, Yemen Arab Republic.

This is a revision of FAO Agricultural Development Paper No. 43, 'Water Laws in Moslem Countries' published in 1954. The earlier paper has been outdated by changes in water law and by the emergence of many new nations in the Moslem world. In this, volume one of a two volume update, a general introduction is given and twelve nations (Afghanistan, Bahrain, Brunei, Iran, Jordan, Kuwait, Morocco, Qatar, Somalia, Tunisia, The Peoples' Democratic Republic of Yemen, and the Yemen Arab Republic) are described. Since Moslem law is based upon revelations transmitted from Allah to man through the agency of the Prophet Mohammed, its religious overtones are unmistakable and Western planners must expect plans to be suspect which ignore or contradict this divine law. Moslem law has faced the practical problems of dividing a limited resource among the populace; however, it should be remembered that the scarcer the water is, the more complicated and elaborate the regulations are. Modern tendencies in Moslem water law make water a national resource under central control and ownership. This is compatible with traditional Islamic thinking which has always viewed the concept of community interest as the basis of Moslem water law. (Bowden-Arizona)
W75-09625

WATER FOR ENERGY SELF-SUFFICIENCY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

BOROUGH OF MORRISVILLE V. DELAWARE RIVER BASIN COMM'N. (RULING ON MOTION TO DISMISS ACTION BY COMMUNITIES DEPENDENT ON DELAWARE RIVER BASIN COMM'N. WHICH ACTION WAS FOUNDED ON A NEPA COMPLAINT).
382 F. Supp. 543-547 (E.D. Penn. 1974).

Descriptors: *Delaware River Basin Commission, *Water supply, *Water allocation(Policy), *Water costs, Delaware, Delaware River, Rivers, Water demand, Basins, Water supply development, Water policy, Water rates, Water requirements, Water resources, Water users, Pennsylvania, Environmental effects, Environment.
Identifiers: *Environmental Impact Statements, NEPA, Injunctive relief.

A number of communities which depended upon the Delaware River Basin Commission for their water supply filed suit to prevent that agency from imposing a charge for water use. The agency moved to dismiss the complaint. The United States District Court for the Eastern District of Pennsylvania held that jurisdiction for plaintiffs' National Environmental Policy Act (NEPA) complaint could be properly founded upon a federal mandamus statute since the administrative action sought to be compelled or restrained was essentially ministerial rather than discretionary. The court rejected an argument that there was no case or controversy on grounds that the fees had not yet been collected. NEPA requires the preparation of an environmental impact statement for all legislative proposals and other major federal actions significantly affecting the quality of the human environment. (Gagliardi-Florida)
W75-09827

UNION CAMP CORP. V. SEMINOLE FOREST WATER MANAGEMENT DISTRICT (SUIT BY SINGLE LANDOWNER TO REQUIRE FORMATION OF A DRAINAGE DISTRICT).
302 So. 2d 419-423 (1st D.C.A. 1974).

Descriptors: *Florida, *Drainage districts, *Judicial decisions, *Wetlands, Legal aspects, Nonstructural alternatives, Water management(Applied), Local governments, State governments, Legislation, Land tenure, Overflow, Water districts, Water control, Drainage.
Identifiers: *Standing(Legal), *Contiguous zone.

Petitioner, a corporate landowner, filed for the formation of a drainage district pursuant to Chapter 298 of the Florida Statutes, which provides that 'owners of the majority of the acreage of any contiguous body of wet or overflowed land or lands subject to overflow' may petition for the creation of a district. Petitioner's lands constituted a contiguous part of an area that is subject to overflow. The State of Florida, the County of Volusia, several adjacent landowners, and owners of lands within the proposed district filed objections. Central to the controversy was whether the statute required a petition by the owners of a majority of the acreage of lands within the proposed district or whether it required a petition by the owners of a majority of the acreage of a contiguous body of lands subject to overflow. The First District Court of Appeal of Florida construed the statute as requiring merely that the lands within the proposed district must be contiguous, and held that a single landowner, such as petitioner, could

apply for the incorporation of a district, but that parties whose lands were within the proposed district must be included in the controversy. The court also held that the adjoining landowners and the county had standing to intervene, while the state did not. (Fernandez-Florida)
W75-09828

JOHNSON V. STATE FARM FIRE AND CASUALTY CO. (ACTION FOR DEATH BY DROWNING IN ARTIFICIAL CANAL WHICH WAS FOUND TO BE NOT NAVIGABLE).
303 So. 2d 779-787 (Ct. App. La. 1974).

Descriptors: *Drowning, *Canals, *Navigation, *Negligence, Rivers, Streams, Fishing, Boats, Boating, Navigable rivers, Navigable waters, *Louisiana.
Identifiers: Proximate causation.

An action was brought for the death of the decedent who drowned after being thrown from a fishing boat while the boat's motor was being operated by the defendant's insured. The Louisiana Court of Appeal held that rivers and streams are regarded as public navigable rivers when they are navigable in fact or are susceptible of use in their ordinary condition as highways of commerce over which trade or travel may be conducted in the ordinary mode of trade or travel on water. An artificial canal, however, can not be presumed navigable even though it might be deep enough to float a pirogue or flat-bottomed fishing boat. The court held the waterway in which the accident happened nonnavigable. It also held the insured negligent and the deceased not contributorily negligent. (Gagliardi-Florida)
W75-09829

PEOPLE V. MCCARTHY (CRIMINAL ACTION FOR OPERATING UNREGISTERED BOAT ON NAVIGABLE WATERS OF PRIVATELY OWNED MARINA).
362 N.Y.S.2d 785-787 (Crim. Ct. City N.Y. 1974).

Descriptors: *Boats, *Boating regulations, *Navigable waters, Highways, Land, Water law, Marinas, *New York, Boating, Water, Navigation, Trafficability.
Identifiers: State policy.

Defendant was charged with operating an unregistered and unnumbered boat upon navigable waters. The Criminal Court of New York City, reasoning that a navigable waterway is akin to a public highway and therefore subject to regulation by the state under its police powers even though the land under the water is privately owned, held that the defendant as lessee of a marina had only a right of possession, and that ownership still resided in the city. Because the state cannot yield its sovereign power and public obligation in regard to navigable waterways, the court held that the defendant-lessee was not entitled to operate an unregistered and unnumbered boat upon a navigable marina under a statute excluding from registration requirements motor boats operated upon waters privately owned. (Gagliardi-Florida)
W75-09830

PASSAIC VALLEY COUNCIL BOY SCOUTS OF AMERICA V. HARTWOOD SYNDICATE, INC. (SUIT BY OWNER OF PART OF RESERVOIR BED AGAINST OWNER OF REMAINDER WHO CLAIMED EXCLUSIVE RIGHT TO HUNT, FISH OR SAIL ON RESERVOIR WATERS).
361 N.Y.S.2d 945-949 (Sup. Ct. App. Div., 3d Dept., 1974).

Descriptors: *Reservoirs, *Easements, Beds, Canals, Fishing, Hunting, Boating, *New York, Dams, Drains, Water, Streams, Rivers, Recreation, Recreation demand.
Identifiers: Evidence, Injunctive relief.

An action was brought by plaintiff as owner of a portion of a reservoir bed under deed from a canal company, claiming rights in the reservoir against defendants, one of whom owned the remainder of the bed and who claimed rights in the reservoir pursuant to a canal company's conveyance of the canal and an earlier grant of hunting, fishing and sailing rights. The New York Supreme Court, Appellate Division, held that determination of whether rights reserved by the canal company in the latter conveyance constituted an easement appurtenant or an easement in gross required a construction of the intent of the parties from the face of the instrument and, in event of ambiguity, examination of the surrounding circumstances. The court found that the deed conveying perpetual and exclusive rights to hunt, fish and sail on the reservoir did not give the defendant the right to exclude plaintiff from undertaking such activities in the area. (Gagliardi-Florida)
W75-09831

CONCH CREEK CORP. V. GUESS (CONFLICTING TITLE CLAIMS TO TIDELANDS INCLUDED IN GRANT FROM GOVERNOR).
209 S.E.2d 560-561 (S.C. 1974).

Descriptors: *South Carolina, *Tidal marshes, *High water mark, *Navigable waters, *Ownership of beds, Judicial decisions, Legal aspects, Legal review, Water law, Boundary disputes, Governments, Public rights, Tidal effects, Tidal streams, Land tenure.

Plaintiff, landowner, brought suit against the State of South Carolina to quiet title to 398 acres of marshland. The property was located between two navigable waterways and was below the high water mark. The 398 acres was part of a larger tract which the plaintiff's predecessor had received in a grant from South Carolina. The property in the grant was specifically described to include the 398 acres and all of the granted property was tideland. The defendant demurred and the trial court overruled holding that title was in the plaintiff. On appeal the State contended that title to land below the high water mark on tidal navigable streams is in the State and is not transferable unless the State specifically does so. The appellate court affirmed the trial court stating that the grant of 645 acres all of which were tidelands was specific enough to indicate the State's intent to transfer title. The court felt there was no reasonable purpose for the grant unless it was to convey title to the plaintiff's predecessor. (Altuve-Florida)
W75-09832

FLORIDA WATER RESOURCES ACT OF 1972 (STATUTE ESTABLISHING WATER MANAGEMENT DISTRICTS FOR THE STATE OF FLORIDA).
Fla. Stat. Ch. 373, sec. 373.012 thru 373.6161 (1973).

Descriptors: *Permits, *Water policy, *Water management(Applied), *Florida, Local governments, State governments, Groundwater, Groundwater recharge, Surface waters, Water resources, Water shortage, Water supply, Water table aquifers, Water wells, Water law, Water levels.
Identifiers: *State policy, Florida Water Resources Act of 1972.

The Florida Water Resources Act of 1972 was enacted in recognition of the importance of water resources to the State, and the necessity for conservation and control in order to realize their full beneficial use. Among the purposes of the Act are management of water and land resources, the promotion of conservation and proper utilization of surface and ground water, and the preservation of natural resources, fish and wildlife. The Act vests in the Department of Natural Resources, the power and responsibility to implement the purposes of the Act, as well as the authority to delegate appropriate powers to the various water management districts in furtherance of the aims of the Act. The Department has authority to exercise supervisory authority over all water management districts, as well as to exercise any power which may be exercised by a water management district. The Department is directed to proceed as rapidly as possible to study existing water resources and to cooperate with the division of state planning to formulate a comprehensive state plan for the use and development of the waters of the state. The Department and district governing boards are authorized to promulgate regulations necessary or convenient to administer the provisions of the Act. (Denvir-Florida)
W75-09833

ARTIFICIAL ISLANDS AND INSTALLATIONS IN INTERNATIONAL LAW,
Rhode Island Univ., Kingston. Law of the Sea Inst.
A. H. A. Soons.
Occasional Paper No 22, July 1974. 30 p, 76 ref, append.

Descriptors: *International law, *International waters, *Law of the sea, *International Boundary and Water Commission, *Islands, Governments, Federal government, Federal jurisdiction, Jurisdiction, Oceanography, Oceans, Shores.
Identifiers: Territory, *Artificial islands.

Legal aspects are discussed of the existence of artificial structures which do not float but are permanently above sea level and of structures which rest upon the seafloor by means of piles or tubes driven into the bottom. The permissibility of constructing artificial islands and installations in internal waters, the territorial sea, and the high seas, respectively, is analyzed, before a discussion of legal ramifications of the construction of such bodies on the legal regimes of surrounding waters is undertaken. The possible effects of the presence of such bodies on delimitation of the territorial sea is also explored. The exercise of jurisdiction to regulate activities on artificial islands and installations is discussed, with a distinction being made between the various jurisdictional zones of the ocean. Finally, draft articles which could be included in a treaty on the law of the sea are presented. (Gerlach-Florida)
W75-09834

JOINT CANADA-UNITED STATES MARINE POLLUTION CONTINGENCY PLAN FOR SPILLS OF OIL AND OTHER NOXIOUS SUBSTANCES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09835

OFFSHORE OIL AND GAS RIGHTS: A COMPARATIVE STUDY,
M. Crommelin.
Natural Resources Journal, Vol 14, No 4, p 457-500, 1974. 1 tab, 237 ref.

Descriptors: *Gases, *Oil, Canada, Environment, Oil industry, Oil reservoirs, Oil pollution, Land, Sea water, United States, Australia, Marine geology, Economics, Economic efficiency, Fuels.
Identifiers: Coastal waters.

The last decade has witnessed a dramatic shift in the focus of world oil and gas exploration and development from the land to the sea. The offshore oil and gas regimes of the United States, the United Kingdom, Canada and Australia are examined to assess their effectiveness in the management of publicly-owned resources. The allocation process of each country and the nature of the rights acquired in each jurisdiction are thoroughly considered and described. Additionally, the four management systems are compared and contrasted as to their relative merits and

deficiencies. The role of government in the management of offshore oil and gas resources is bound to increase in the future. Public ownership of these resources, their location within a complex marine environment, and their growing importance to economic development make this result inevitable. The alternative forms that government intervention will take are either the establishment of a flexible and efficient management regime controlling the activities of private enterprise or direct governmental participation. (Gagliardi-Florida)
W75-09836

THE RESERVE MINING CASE: PROMISES, PROMISES,
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5G.
W75-09838

NATIONAL AUDOBON SOCIETY V. WHITE (SUIT TO ENJOIN TRESPASS ON PRIVATELY OWNED AND MAINTAINED NAVIGABLE CANAL).
302 So. 2d 660-668 (La. Ct. App. 3d Cir. 1974).

Descriptors: *Louisiana, *Trespass, *Public access, *Riparian rights, *Canals, Legal aspects, Easements, Public rights, Navigable waters, Permits, Judicial decisions, Land tenure, Right-of-way, Riparian land, Water rights, Prescriptive rights, Legislation, Water law, Equity.
Identifiers: Injunctive relief, Navigation obstruction, Water rights(Non-riparian).

Plaintiffs sought to enjoin defendants from trespassing on a canal located on plaintiff's land. The issue presented was whether a private landowner can prohibit others from using a navigable canal constructed by him on his own property. Plaintiffs contended that the canal is private and that they have the right to restrict the use of the canal. They conceded the defendants previously were granted permission to use the canal, but argued that permission was later withdrawn. Defendants alleged that the canal is a public waterway and plaintiffs have no right to restrict the use of it. They further contend that plaintiffs are barred by Louisiana statute from obstructing a navigable waterway. Granting injunctive relief, the Court of Appeal of Louisiana, Third Circuit, held that a canal which was constructed with private funds on private property, which was posted and which had been open for public use only by written permission was a private canal subject to the owner's right to regulate its use. Further, the court concluded that the statute which prohibits obstruction of a highway of commerce did not apply, even though the canal was navigable. (Fernandez-Florida)
W75-09839

CONSERVATION COUNCIL OF NORTH CAROLINA V. COSTANZO (ACTION TO ENJOIN CONSTRUCTION OF A MARINA ON ISLAND IN ATLANTIC OCEAN AND TO REQUIRE ENVIRONMENTAL IMPACT STATEMENT BY CORPS OF ENGINEERS).
505 F.2d 498-502 (4th Cir. 1974).

Descriptors: *North Carolina, *Judicial decisions, *Administrative agencies, *Constitutional law, Legal aspects, Legal review, Law enforcement, Social aspects, Social needs, Social values, Recreation facilities, Recreation demand, Beds, Marinas, Coastal structures, Environmental effects, Regulation, Public rights, Construction.
Identifiers: *Environmental Impact Statements, *Standing(Legal).

Plaintiff, a conservationist group in North Carolina, sought a preliminary injunction restraining a developer from further construction of a marina on Bald Head Island and an order requiring the District Engineer of the Army Corps of Engineers to prepare and file a detailed environmental impact statement. The District Court denied the motion for preliminary injunction and dismissed the action for want of standing. The Court of Appeals affirmed on the ground that to have standing to seek judicial review of agency action, the plaintiff must allege an individualized interest at stake which would place him among the injured. The plaintiff's claim of potential loss of recreational use of the island as a licensee or trespasser was not sufficient to confer standing. The court did find merit in the plaintiff's claim that the construction would interfere with the right to travel through or otherwise use navigable portions of the submerged land and remanded. (Fernandez-Florida)
W75-09840

WATER STRATEGY--STATEMENT OF POLICY FOR IMPLEMENTING CERTAIN REQUIREMENTS OF THE 1972 FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09841

OFFSHORE DEVELOPMENT AND MARINE POLLUTION,
United Nations Secretariat. Office of Legal Affairs.
For primary bibliographic entry see Field 5B.
W75-09842

TOWARDS A NEW REGIME FOR OCEAN DEVELOPMENT,
Tohoku Univ., Sendai (Japan). School of International Law.
S. Oda.
Ocean Development and International Law Journal, Vol 1, No 3, p 291-302, 1973. 25 ref.

Descriptors: *Law of the Sea, *Marine fisheries, *Commercial fishing, *Continental shelf, Coasts, Oceans, Navigation, United Nations, Foreign countires, Governments, International law, Manganese, Foreign trade, Foreign waters, International waters, Water law, Conferences, Fishing, Jurisdiction, Legislation.
Identifiers: *Coastal waters, *Territorial waters, Territorial seas(Jurisdiction), Ocean development, Seabeds.

In light of the great benefits that Japan has received under traditional concepts of the freedom of the high seas, Japan should not close its eyes to the changing concept of the law of the sea, particularly in the field of resources management. Two distinct trends are described: first, the growing interest of coastal states over offshore resources, which may be satisfied only through the exercise of coastal jurisdiction, and second, the aspirations of a number of countries toward international control of the resources of the vast ocean areas, which may eventually replace the concept of free competition. Neither extreme will prove satisfactory, since the implementation of one scheme will ignore competing needs. A new and flexible approach is needed to enable an over-all accommodation of the diverse interests involved. The division of the sea into the traditional concept--the high seas and the territorial sea--will no longer prove satisfactory in view of present-day problems of the sea. A pragmatic basis is proposed for narrowing the differences that exist between the realities and the ultimate objectives of the international community. (Fernandez-Florida)
W75-09843

ENVIRONMENTAL CRITIQUE (THE 1972 FEDERAL WATER POLLUTION CONTROL ACT: PROBLEMS AND PROSPECTS AFTER ONE YEAR),
Natural Resources Defense Council, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09844

INTERNATIONAL LAW AND CANADIAN ARCTIC POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W75-09846

INFLUENCE OF THE ENERGY CRISIS UPON THE FUTURE OF ENVIRONMENTAL POLICY,
Committee on Interior and Insular Affairs (U.S. Senate).
D. A. Dreyfus, and R. D. Grundy.
Environmental Affairs, Vol 3, p 252-274, 1974. 53 ref.

Descriptors: *Social values, *Institutional constraints, *Conservation, *Environmental effects, Social needs, Social impact, Economic impact, Economic justification, Political aspects, Political constraints, Research and development, Energy budget, Energy, United States, Legal aspects, Legislation, Regulation, Control.
Identifiers: Energy needs.

The present energy crisis has emphasized the long standing conflict between energy needs and environmental goals and the need for changing energy consumption patterns. The United States intensive use of energy is closely linked to its high standard of living and the present rate of consumption indicates that in the future the energy shortage will become even more acute. In order to meet the present crisis, certain national policies will have to be restructured. The newest policies, particularly those involving environmental constraints, will be amended or revoked because they have not yet been incorporated into the structure of the energy systems or the cultural and economic structures of society. Three areas where such restructuring of policies will probably take place are federal decisions on surface mining, the Alaska pipeline, and emergency energy measures. Despite this restructuring it is highly unlikely that any major body of environmental law will be stricken from the statutes, because environmentalism has become too well established in society. (Altuve-Florida)
W75-09847

ENVIRONMENTAL PROTECTION BY COASTAL STATES: THE PARADIGM FROM MARINE TRANSPORT OF PETROLEUM,
Fordham Univ., Bronx, N.Y. School of Law.
For primary bibliographic entry see Field 5G.
W75-09848

MARINE OIL SPILLS: A PROBLEM IN ENVIRONMENTAL MANAGEMENT,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-09849

THE PUBLIC TRUST DOCTRINE IS ALIVE AND KICKING IN NEW JERSEY TIDAL-WATERS: NEPTUNE CITY V. AVON-BY-THE-SEA--A CASE OF HAPPY ATAVISM,
Louisville Univ., Ky. School of Law.
L. R. Jaffee.
Natural Resources Journal, Vol 14, p 309-335, 1974. 137 ref.

Descriptors: *Public access, *Usufructuary right, *Tidal waters, Access routes, Beaches, Navigation, Fisheries, *New Jersey, Public rights, Shores, Recreation, Water, Water purification, Water quality, Water demand, Water policy, Water resources, Roads, Fishing.
Identifiers: Public trust doctrine, Administrative regulations, Standing(Legal).

Neptune City v. Avon-By-The-Sea holds that the public trust doctrine prohibits the state of New Jersey and its subdivisions from discriminating among state citizens in its foreshore access regulations. The decision apparently also secures citizen access to foreshore at points of intersection with dedicated public ways. Neptune City also suggests that the public may have rights of wetbeach access over private drybeach, as well as usufructuary rights respecting wetbeach allocated to private possession. In addition, no person or branch of state government can abridge citizen navigation, fishery, recreation, access and water purity interests. The case also stands for the proposition that New Jersey citizens have standing to challenge private and state-government threats to such tidal water interests. Absolute power to cut off citizen foreshore access by realty grant, or to plan roads not to connect with foreshore cannot, consistently with the public trust doctrine, vest in any branch or arm of the state government. Although principally related to navigation, fishing and attendant interests, the public trust is defined by actual citizenry demand. In order to fully protect citizen remedies, creation is recommended of a special tidal water resource allocation court with technological, scientific and economic expertise as well as juridicial competence, and the power to review legislative and quasi-legislative findings. (Gagliardi-Florida)
W75-09850

6G. Ecologic Impact Of Water Development

ARIZONA'S REMOTE SUBDIVISIONS: AN INVENTORY,
Arizona State Office of Economic Planning and Development, Phoenix. Planning Div.
D. M. Hamernick, and B. A. Brown.
January 1975, 39 p, 15 fig, 9 tab.

Descriptors: *Arizona, *Surveys, *Planning, *Land use, *Land development, *Recreation demand, *Colorado River, Projections, Environmental effects, Rural areas.
Identifiers: *Subdivisions.

The basic inventory reveals the magnitude of remote subdividing activity and its effect on Arizona's environment. The statistics show 2,565 remote subdivisions on 943,460 acres cut up into 742,829 lots, of which 83% has been so subdivided since 1959. The supply of lots is far in excess of the estimated population increase projected to the year 2,000. Widely scattered throughout the state, these lands are sparsely settled, in many instances located at a distance from urban retail trade and service areas and some in areas with apparent water supply and flooding problems. Although there is little evidence that these aspects are likely to change, there is still a significant amount of private land that will obviously be subdivided in future. Attention is specifically directed to the 750-mile-long Colorado River, a major water recreation area, where nearly 40,000 acres have already been subdivided into 69,000 lots within 10 miles of the Arizona side of the River. (McLachlan-Arizona)
W75-09583

ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
For primary bibliographic entry see Field 7C.
W75-09615

EVALUATION OF ENVIRONMENTAL IMPACT OF LANDFILLS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W75-09761

EVALUATING EFFECTS OF WATER RESOURCE DEVELOPMENTS ON WILDLIFE HABITAT,
Missouri Dept. of Conservation, Jefferson City.
C. Daniel, and R. Lamaire.
Wildlife Society Bulletin, Vol 2, No 3, p 114-118, Fall, 1974. 2 tab.

Descriptors: *Wildlife habitats, *Water resources development, *Numerical analysis, *Land use, Wildlife conservation, Statistics, Habitat improvement, Environmental effects, Population, Evaluation.

A system is presented for evaluating effects of water resource development projects on wildlife habitat, based upon existing habitat values rather than on man's utilization of wildlife. Effects of water resource projects on wildlife habitat are summarized numerically, and unique habitat types and endangered fauna or flora are considered. Credit can be given for project benefits as well as losses. The amount of mitigation needed is determined by the same evaluation procedures. The basic philosophy of the system is that all land has an existing wildlife habitat value that can be expressed numerically. (Bowden-Arizona)
W75-09790

THE ECOLOGICAL MANAGEMENT OF ARID AND SEMI-ARID RANGELANDS IN AFRICA AND THE NEAR EAST: AN INTERNATIONAL PROGRAMME.
Report on an Expert Consultation, held May 27-31, 1974, Food and Agriculture Organization of the United Nations, Rome, Italy, 1974. 52 p, 6 append.

Descriptors: *Africa, *Carrying capacity, *Climatic data, *Drought, *Arid lands, Asia, United Nations, Ecosystems, Range management, Human population, Research priorities, Governments, Planning, Land use.
Identifiers: Overpopulation, Overgrazing.

Africa and the Near East contain the world's largest expanse of arid and semi-arid rangeland; recent droughts and famine have pointed out that this expanse has several problems of overpopulation, overgrazing and poor land use. The ecological balance of the region is fragile and with few exceptions, recent attempts to develop sedentary live-stock operations similar to those of arid regions of Australia or America have failed. Future exploitation of the region should be limited to a level that the land can support. If this is not done, future droughts will worsen the situation and further limit the region's ability to sustain human and animal life. The Food and Agriculture Organization can help nations in the region by providing the expertise for discovering just what level of exploitation is ecologically sound. Nations in the region must setup agencies to enforce such guidelines. It is concluded that the only way to alleviate human suffering during the recurring droughts that occur in the region is to lower human numbers and human use. (Bowden-Arizona)
W75-09791

A SURVEY OF THE NESTING HABITATS OF THE WHITE-WINGED DOVE IN ARIZONA,
Arizona Game and Fish Dept., Phoenix. Research Div.
D. D. Wigal.
Special Report No 2, June, 1973. 37 p, 10 fig, 8 tab, 3 append.

Descriptors: *Arizona, Riparian land, *Tamarisk, *Mesquite, *Nesting cover, *Game birds, *Wildlife habitats, Flood control, Habitats, Wildlife conservation, Habitat improvement, Water reuse.
Identifiers: *White-wing doves.

This study was begun in 1968 when virtually every mile of riparian woodland habitat important to doves was either being cleared, was authorized for clearing, or was being studied for eventual clearing. This habitat destruction was justified by flood control, water salvage, or both. These riparian habitats are the most successful nesting areas for white wing doves. Removal of salt cedar and mesquite thickets will possibly threaten the doves as an important game species for hunters although lower populations will be secure because inferior nesting habitat is not immediately threatened. A conflict exists between destroying riparian habitats for flood control and water salvage and maintaining white dove populations at a level sufficient for widespread hunting. (Bowden-Arizona)
W75-09794

DROUGHT IN THE GHANA SAVANNAH: A REPORT TO THE U.S. AID MISSION TO GHANA,
Arizona Univ., Tucson. Office of Arid Lands Studies.
J. D. Johnson.
1974, 5 p.

Descriptors: *Drought, *Africa, *Soil erosion, *Burning, *Arid lands, Forecasting, Human population, Forest management, Range management, Deserts, Agriculture, Climatic data, Research facilities, Research priorities, Remote sensing, Water supply, Carry capacity, *Grasslands, Land use.
Identifiers: *Ghana's Savannah.

The effects of the current drought in the Sahelian zone of Africa on the future of Ghana are explored. While rainfall has not declined in the savannah belt of Ghana, some features of desertification have appeared; increasing soil erosion, loss of forest vegetation, decline of groundwater, drying up of once perennial streams, and reported losses in soil fertility. Also, famine in the Sahel has put pressure on the nation's food resources and necessitated government patrols to control immigration. Possibly, some of the areas's degradation is the result of the use of burning by local farmers. In some areas overgrazing is a problem. By acting now, Ghana, can heighten chances of halting or reversing the desertification process in the savannah belt. Several recommendations are made: research on the area should be integrated; a documentation center should be established; an extension service suitable to the region's farmers should be created; more data must be collected; burning should be curtailed; the carrying capacity of the land should be determined; remote sensing methods should be utilized for automated mapping; various water harvesting methods should be studied and compared; major problems should be identified and given priority. (Bowden-Arizona)
W75-09795

DROUGHT, A RECURRENT ELEMENT OF CLIMATE,
Maryland Univ., College Park. Graduate Program in Meteorology.
For primary bibliographic entry see Field 2B.
W75-09799

DETERIORATION OF THE ECOLOGICAL EQUILIBRIUM IN THE ARID ZONES OF NORTH AFRICA,
H. N. Le Houerou.
Food and Agriculture Organization of the United Nations, Rome, Italy (1974). 11 p, 1 tab, 39 ref.

Descriptors: *Drought, *Africa, *Balance of nature, *Flood frequency, *Arid climates, Climatic data, Human population, Exploitation, Ecology, Ecosystems, History, Livestock, Range management, Climatology, Environmental effects, Deserts.
Identifiers: *Desertification, Overgrazing, Morocco, Algeria, Tunisia, Libya.

The arid zone of North Africa is considered those parts of Morocco, Algeria, Tunisia and Libya lying

between the 400 mm and 100 mm isohyets. Ecological equilibrium is essential for the sustained productivity of ecosystems; this balance has been broken almost everywhere in the arid zone of North Africa. This break is due to a sharp increase in population since about 1930, a six fold increase since the beginning the the century. Man and his animals have exceeded the carrying capacity of the land. The deterioration of the ecological equilibrium of the past centuries has resulted in expansion of the desert, in decreased production and productivity of the natural or artificial ecosystems. Huge tracts of land have become useless for man and his livestock as a result of erosion; and catastrophic floodings are throught to occur much more often than in the past. There is no evidence so far that the climate has grown more arid in the last century. Thus, the worsening condition of the region is the result of human exploitation, not of climatic change altering the amount of water available. (Bowden-Arizona)
W75-09802

MAINTENANCE OF THE FEDERAL NAVIGATION PROJECT IN SCARBORO RIVER AT SCARBORO, MAINE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09811

INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09812

DETAILED PROJECT REPORT FOR LOCAL FLOOD PROTECTION, ZACATE CREEK, LAREDO, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W75-09813

NORTH FORK NOLIN RIVER WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09814

EDIZ HOOK BEACH EROSION CONTROL, PORT ANGELES, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
For primary bibliographic entry see Field 8A.
W75-09815

CHARLES RIVER DAM, BOSTON, MASS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8D.
W75-09816

WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR THE LOWER RARITAN RIVER BASIN AND FOR THE SOUTH SHORE OF RARITAN BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W75-09817

TABLE ROCK LAKE, WHITE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Little Rock, Ark.
For primary bibliographic entry see Field 8C.
W75-09818

PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE-SALE, OFFSHORE MISSISSIPPI, ALABAMA, AND FLORIDA, VOLUME 2, POTENTIAL ENVIRONMENTAL IMPACTS, ETC. (ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-09820

PROPOSED NAVIGATIONAL MAINTENANCE DREDGING PROJECT AT GUILFORD HARBOR, GUILFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8A.
W75-09821

UPPER MULBERRY RIVER WATERSHED, BARROW, GWINNETT, HALL, AND JACKSON COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-09822

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATERS ALONG THE LOUISIANA COAST (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 5G.
W75-09823

PROPOSED MAINTENANCE DREDGING OF THE CHANNEL FROM U.S. COAST GUARD SANTA ROSA STATION MOORINGS TO NAVIGABLE WATERSHED IN PENSACOLA BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard District (8th), New Orleans, La.
For primary bibliographic entry see Field 8A.
W75-09824

PREVENTION AND MITIGATION OF SHORE DAMAGES, KAHULUI HARBOR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 8A.
W75-09825

ATCHISON, TOPEKA AND SANTA FE RY. CO. V. CALLAWAY (ACTION BY RAILROAD, ENVIRONMENTALISTS AND OTHERS TO HALT RECONSTRUCTION OF LOCK AND DAM ON UPPER MISSISSIPPI RIVER NAVIGATION SYSTEM BY DEFENDANT CORPS OF ENGINEERS).
For primary bibliographic entry see Field 8A.
W75-09826

THE RESERVE MINING CASE: PROMISES, PROMISES,
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5G.
W75-09838

INFLUENCE OF THE ENERGY CRISIS UPON THE FUTURE OF ENVIRONMENTAL POLICY,
Committee on Interior and Insular Affairs (U.S. Senate).
For primary bibliographic entry see Field 6E.
W75-09847

ENVIRONMENTAL PROTECTION BY COASTAL STATES: THE PARADIGM FROM MARINE TRANSPORT OF PETROLEUM,
Fordham Univ., Bronx, N.Y. School of Law.
For primary bibliographic entry see Field 5G.
W75-09848

MARINE OIL SPILLS: A PROBLEM IN ENVIRONMENTAL MANAGEMENT,
British Columbia Univ., Vancouver. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-09849

7. RESOURCES DATA

7A. Network Design

AVERAGING ERRORS IN MONTHLY EVAPORATION ESTIMATES,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-09590

7B. Data Acquisition

MEASURING FLOW OF POLLUTED EFFLUENTS (POUR LA MESURE DU DEBIT DES EFFLUENTS POLLUES).
For primary bibliographic entry see Field 5A.
W75-09370

FLUID SAMPLING DEVICE,
Houma Valve Service, Inc., La. (assignee)
M. A. Soudelier.
United States Patent 3,812,722. Issued May 28, 1974. Official Gazette of the United States Patent Office, Vol 922, No 4, p 1074, May, 1974. 1 fig.

Descriptors: *Patents, *Sampling, Water analysis, *Equipment, Liquids, Conduits.
Identifiers: *Fluid sampling device.

Fluid is sampled as it flows through a conduit by repeated expansion of a pressure chamber in an elongated tubular housing. This is projected into the flow conduit through a sampling outlet which is releasably clamped to the housing. A pressure chamber is formed between an inlet check valve and reciprocating piston, mounted on a discharge check valve, through which fluid travels to a passage in the piston plunger during contraction of the pressure chamber. Responding to a predetermined pressure of the fluid in the plunger passage, a relief valve carried by the plunger opens to supply a fluid sample. (Leibowitz-FIRL)
W75-09422

METHODOLOGICAL APPROACHES IN HAWAIIAN FOG RESEARCH,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W75-09526

DIGITAL INSTRUMENTATION AND TELEMETRY FOR WATER RESOURCES RESEARCH,
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 511,

$3.25 in paper copy, $2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report, December 1974. 7 p, 3 ref. OWRT B-014-MONT(1).

Descriptors: *Instrumentation, *Telemetry, *Electronic equipment, *Data collections, Montana, Remote sensing, Research and development, Measurement, Control systems.
Identifiers: *Data acquisition systems, Bridger data center.

The principal objective was to continue the development of digital instrumentations and telemetry for water resources research. Considerable study was made as to the specifications for the remote instrument package. Several custom data acquisition systems were built for various sponsors and the experience gained in these developments was used in the prototype development used in this study. From the system design has come the specifications, design, and development of a number of system components. The ASR33 teletype has been modified to interface to other system components. A digital clock and multiplexor has been developed that outputs the standard time record each time a control signal is applied to the multiplexor control input. Several transmitter and receiver units have been incorporated in remote data acquisition systems operated by other agencies. For example, the Soil Conservation Service is using them in their Montana snow survey network and the Northern Plains Soil and Water Research Laboratory (ARS) is using a half duplex radio link to their remote trailer. (Holje-Montana State)
W75-09529

BIOLOGICAL ASSAY OF FRESH WATERS BY A NEW METHOD, DIELECTROPHORESIS,
Oklahoma State Univ., Stillwater. Dept. of Physics.
For primary bibliographic entry see Field 5A.
W75-09531

BRANDING CHINOOK, COHO AND SOCKEYE SALMON FRY WITH HOT AND COLD METAL TOOLS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
J. R. Smith.
Prog Fish-Cult, Vol 35, No 2, p 94-96, 1973.

Descriptors: *Chinook salmon, *Sockeye salmon, Washington, *Marking techniques, Fry.
Identifiers: *Branding techniques(Fish), *Coho salmon.

One hot and 2 cold branding techniques were tested on chinook, coho and sockeye salmon fry. These tests were made at the National Marine Fisheries Service, Northwest Fisheries Center in Seattle, Washington. All produced satisfactory short-term marks without excessive mortality.--
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W75-09561

WEATHER SATELLITE PICTURE RECEIVING STATIONS, APT DIGITAL SCAN CONVERTER,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
C. H. Vermillion, and J. C. Kamowski.
NASA Technical Note D-7994, May 1975. 106 p, 36 fig, 1 tab, 1 ref, 5 append.

Descriptors: *Cloud cover, *Radio waves, *Satellites(Artificial), Clouds, Meteorological data, Radio communication systems, Radioecology, Meteorology, Weather patterns, Digital computers, Weather, Linear programming, Photography, Aircraft.
Identifiers: *Automatic Picture Transmission, Scanning radiometers, Digital scan converter.

The Automatic Picture Transmission (APT) Digital Scan Converter is used at APT ground stations to convert signals received from APT scanning radiometers to data compatible with ground equipment designed to receive signals from APT vidicons aboard operational meteorological satellites. All information necessary to understand the circuit theory, functional operation, general construction, and calibration of the converter was presented. Brief and detailed descriptions of each of the individual circuits were also given. Each description was accompanied by a schematic diagram. Listings of integral parts and testing equipment required as well as an overall wiring diagram were included. This unit, which can be constructed from locally procured, low-cost components, when connected between the RF receiver and the output display unit as the ground station, will enable the user to readily accept and process, as required, weather photographs from operational meteorological satellites. (Roberts-ISWS)
W75-09588

DEVICE FOR UNDERWATER OBSERVATION,
J. F. Clark.
US Patent No 3,879,953, 4 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 1966, April 29, 1975.

Descriptors: *Patents, *Underwater, *Turbidity, Water pollution, Water quality, Equipment.
Identifiers: *Underwater observation.

This invention permits observation of objects in a turbid underwater environment. The invention comprises an enclosure which can be fitted around at least a portion of an underwater object which it is desired to observe visually or photographically. The enclosure can be pumped so that the environmental water in it is circulated through a filter to clear the water, or the environmental water can be pumped out and clear water pumped to replace it. The device is made from pieces of clear plastic which are joined together in a watertight manner. It includes hose fittings, pump and filter. (Sinha-OEIS)
W75-09640

SOIL MOISTURE SENSING SYSTEM,
For primary bibliographic entry see Field 2G.
W75-09651

AN INEXPENSIVE MACROINVERTEBRATE BIOASSAY TABLE FOR USE IN CONTINUOUS-FLOW TOXICITY TESTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5A.
W75-09676

AUTOMATION IN A WATER QUALITY LABORATORY SCHEME,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 5A.
W75-09723

EVALUATION OF SAMPLE PREPARATION TECHNIQUES FOR ALGAL BIOASSAYS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5A.
W75-09734

AUTOMATIC U.V.-CONTROL SYSTEM FOR RELATIVE EVALUATION OF ORGANIC WATER POLLUTION,
Vyzkumny Ustav Vodohospodarsky, Ostrava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W75-09735

EVALUATION OF A NEW SPAWNING MAT MATERIAL,
National Fish Hatchery, Tishomingo, Okla. Warm Water Hatchery Biology Center.
J. P. McCraren, and R. M. Jones.
Prog Fish-Cult, Vol 35, No 2, p 81, 1973, Illus.

Descriptors: Spawning, Fish reproduction, Evaluation.
Identifiers: *Goldfish(Fantail), Maintenance, *Spawning mats, Nylon bristle brushes.

Spawning mats for fantail goldfish were constructed using newly developed nylon bristle brushes. The mats required less maintenance and were more durable and easily handled than the widely-used moss mat. No preference between mat types was displayed by spawning goldfish.--
Copyright 1973, Biological Abstracts, Inc.
W75-09749

ADENOSINE TRIPHOSPHATE MEASUREMENTS IN SOIL AND MARINE SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-09764

DEOXYGENATION IN NATURAL STREAMS,
Nebraska Natural Resources Commission, Lincoln. Data Bank.
For primary bibliographic entry see Field 5B.
W75-09767

DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP) USER'S GUIDE,
Air Weather Service, Scott AFB, Ill.
L. G. Dickinson, S. E. Boselly, III, and W. S. Burgmann.
AWS-TR-74-250, December 1974. 109 p, 78 fig, 7 tab, 33 ref, 2 append.

Descriptors: *Satellites(Artificial), *Meteorology, *Remote sensing, Instrumentation, Equipment, Clouds, Cloud cover, Hurricanes, Infrared radiation, Data collections, Meteorological data.

The capabilities of the spacecraft, sensors, and data processor for the Defense Meteorological Satellite Program were described. Many meteorological and geophysical uses of these data were examined, and examples were used to illustrate the capabilities of the system to tailor the imagery for a large variety of present and future users. (Sims-ISWS)
W75-09770

A STUDY OF THE SURFACE FLUID FLOW CHARACTERISTICS OF THE NEW YORK BIGHT AND THE DEVELOPMENT OF RESEARCH DATA DISPLAY TECHNIQUES,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-09783

7C. Evaluation, Processing and Publication

RECHARGE SIMULATION MODEL,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-09518

DYNAMIC PROGRAMMING OPTIMIZATION: A WATER DISTRIBUTION SYSTEM DESIGN,
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-243 507, $4.75 in paper copy, $2.25 in microfiche. Technical

Report No 83, September 1974. 69 p, 13 fig, 4 tab, 16 ref. OWRT B-029-HI(3), and B-034-HI(3). 14-31-0001-3874, and 14-31-0001-4074.

Descriptors: *Distribution systems, Design, Programming languages, *Computer models, *Computer programs, *Hydraulic conduits, *Irrigation, Systems engineering, *Water distribution(Applied), Transmission lines, Fluid mechanics, Flow, Optimization, *Dynamic programming, Networks.
Identifiers: *Fluid transport system, Interactive Fortran language.

A computation technique based on the dynamic programming approach using the interactive Fortran language has been developed. The computerized design procedure can be used to obtain optimal design for single source water or other compressed fluid systems with a finite number of diverging branches and loops. Pumping effect on a single source system cannot be optimized; however, the developed procedure does allow quick evaluation of many alternate pumping pressure. Similarly, multiple source network with converging branches can only be evaluated by the repeated use of the computerized procedure. Dynamic programming has been proved to be very powerful for the analysis and design of a water network. From an engineer's point of view, this approach can be used to design any conceptual water network with little limitaion.
W75-09525

METHODOLOGICAL APPROACHES IN HAWAIIAN FOG RESEARCH,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2B.
W75-09526

DISTRIBUTION AND DYNAMICS OF AQUATIC INSECTS IN THE ELK CREEK EXPERIMENTAL WATERSHED, LUBRECHT FOREST, MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-09528

DIGITAL INSTRUMENTATION AND TELEMETRY FOR WATER RESOURCES RESEARCH,
Montana State Univ., Bozeman. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7B.
W75-09529

GOUNDWATER MODELS,
For primary bibliographic entry see Field 2F.
W75-09582

EVAPORATION FROM WATER SURFACES IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2D.
W75-09586

AVERAGING ERRORS IN MONTHLY EVAPORATION ESTIMATES,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 2D.
W75-09590

INFORMATION EXCHANGE ON WATER RESOURCES COMPUTER PROGRAMS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
G. Rodenhuis, and A. A. Smith.
Journal of Hydraulic Research, Vol 13, No 1, p 113-123, 1975. append.

Descriptors: *Information retrieval, *Water resources, *Information exchange, *Computer programs, Data storage and retrieval, Documentation, Indexing.

At the fifteenth International Association for Hydraulic Research congress, a task committee was established for information, documentation, and liason of information exchange on water resources computer programs. The committee objectives were: (1) to collect and compile information concerning available computer programs for solution of water resources engineering problems, (2) to make this information available in a convenient and useful form, and (3) to contact other groups and organizations compiling similar information for their comments and cooperation. A pilot project was established as a first step to guide the determination of the format and scope of documentation for available water resources computer programs. A proposed questionnaire given in an appendix comprises a series of data-coding entries of documentation of computer programs. (Humphreys-ISWS)
W75-09591

GEOGRAPHIC VARIATION OF THE STATISTICAL PARAMETERS OF HYDROMETEOROLOGICAL DATA OF THE UNITED STATES,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2B.
W75-09605

ENVIRONMENTAL GEOLOGY OF AN AREA IN WEST-CENTRAL ALABAMA,
Geological Survey of Alabama, University. Environmental Div.
P. H. Moser, and M. J. Keener.
Atlas Series 7, 1975. 56 p, 52 fig, 101 ref, 54 photo. HUD Grant P-1020, P-1042.

Descriptors: *Maps, *Environment, *Alabama, *Natural resources, *Regional development, Geology, *Data collections, Channels, Water resources, Energy, Mineralogy, Topography, Transportation, Climatology, Population, Surface waters, Groundwater, Planning, Economics.
Identifiers: Tennessee-Tombigbee Waterway.

The environmental data necessary to plan for development brought on by the construction of the Tennessee-Tombigbee Waterway were presented. The study area includes all of Sumter County and those parts of Greene and Pickens Counties adjacent to the Tombigbee River. Land use is not limited to crops, pasture, forest, and related industries. Substantial supplies of surface water and groundwater are available and should encourage economic development. Sand and gravel are available for construction; abundant chalk and clay are available for use as lighweight aggregate. Energy sources in this area have not been fully developed. A coal-fired stream plant provides electricity to surrounding areas and a narrow band of lignite that has not been developed occurs in Sumter County. This area has the potential to become more productive; therefore, information was provided on the area's positive characteristics and its limiting factors were enumerated so that development will be accomplished in an orderly and efficient manner. (Scott-ISWS)
W75-09615

ATLAS OF RIVER BASINS OF THE UNITED STATES.
Soil Conservation Service, Washington, D.C.
Second Edition, June 1970. 92 p.

Descriptors: *River basins, *United States, *Maps, *Regional analysis, Rivers, Tributaries, Streams, *Drainage area, *Water resources, *Land resources, Soils, Climates, Vegetation, Topography, Land use, Agriculture, Soil conservation, Water conservation, *Data collections.

Eighty-two maps of river basins or segments in the United States were given. Seventy-eight cover the 48 conterminous states. One map shows part of the drainage system of the Columbia River in Canada. One map covers Alaska, and two cover Hawaii. Delineation of rivers and tributaries was limited to those with drainage areas of 700 sq mi or more because projections of data for smaller areas are not statistically reliable. The rivers and tributaries were grouped into 20 water resource regions. Some of the regions were divided into areas in order to arrange natural hydrologic units. In Alaska and Hawaii, divisions of the regions were called subregions. In many areas of the 48 conterminous states, particularly in the West, there are closed basins have drainage areas of more than 700 sq mi. Some of these basins were separately delineated, especially if economic development utilizes the available water resource to the maximum extent. An index of river basins lists the rivers and tributaries for each of the 18 regions in the conterminous states. The subregions and significant streams for Hawaii and the subregions for Alaska were listed. The rivers and tributaries having drainage areas of more than 700 sq mi were listed. Included was a map that shows the distribution of land resource regions and areas in the conterminous states. Each of the 24 land resource regions has a similar broad pattern of soils, climate, native vegetation, water resources, topography, and land use. These regions are further divided into major land resource areas which are alike in their relationships to agriculture. The emphasis was on combinations and intensities of problems in soil and water conservation. (Scott-ISWS)
W75-09616

MATHEMATICAL MODELS IN HYDROLOGY,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2A.
W75-09624

FORMATION FACTORS AND THEIR USE IN ESTIMATING WATER QUALITY IN MISSISSIPPI AQUIFERS,
Geological Survey, Jackson, Miss.
R. Newcome, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-242 801/AS, $3.25 in paper copy, $2.25 in microfiche. Water-Resources Investigations 2-75, May 1975. 1 sheet, 6 ref.

Descriptors: *Aquifer characteristics, *Water quality, *Electrical well logging, Well data, Mississippi, Electrical resistance, Geology, Borehole geophysics, Sites, Hydrogeology, Forecasting, Correlation analysis, Sampling, Geologic formations, Planning, Water supply, Water types, Hydrologic data, Groundwater.
Identifiers: Water-bearing unit, Formation factor.

Electric logs constitute one of the most useful data sources in groundwater hydrology. More than 100 calculations of the electrical resistivity formation factor have been made for sand bed aquifers of Mississippi. This 1-sheet atlas shows the locations of wells at which electric logs and water samples were used to determine the factors. Because the factors do not all have the same degree of reliability, they are differentiated in three columns of a table. Formation factors are presented by water-bearing unit in the table to permit averaging of values for a unit and comparison with those of other units. The average of all formation factors determined is 3.6 and the median value is 3.2. There is however, as much range in the values for a given water-bearing unit as there is among the units. This indicates that in calculation of water quality the overall average value (3.6) may be as valid in many situations as the average determined for the specific water-bearing unit. Differences in formation factor appear to be related to water type and to porosity, cementation, and hydraulic conductivity of the sand. (Woodard-USGS)
W75-09703

MAP SHOWING DRAINAGE AREAS, MARLBOROUGH QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
M. P. Thomas, and J. E. Palmer.
Miscellaneous Field Studies Map MF-645 B (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 128), 1975. 1 sheet, 1 map, 1 ref.

Descriptors: *Maps, *Drainage area, *Connecticut, River basins, Watersheds(Basins), Urban hydrology.
Identifiers: *Marlborough(Conn).

This map shows stream system and drainage areas that contribute streamflow to selected sites on streams in the Marlborough quadrangle, Connecticut. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09704

MAP SHOWING DRAINAGE AREAS, WEST SPRINGFIELD QUADRANGLE, MASSACHUSETTS-CONNECTICUT,
Geological Survey, Boston, Mass.
C. J. Londquist, and M. P. Thomas.
Miscellaneous Field Studies Map MF-653 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 129), 1975. 1 sheet, 1 map, 1 ref.

Descriptors: *Maps, *Drainage area, *Connecticut, *Massachusetts, Riverbasins, Watersheds(Basins), Urban hydrology.
Identifiers: *West Springfield(Mass).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the West Springfield quadrangle, Connecticut-Massachusetts. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09705

CONTOUR MAP OF THE BEDROCK SURFACE, COLLINSVILLE QUADRANGLE, CONNECTICUT,
Geological Survey, Hartford, Conn.
E. H. Handman.
Miscellaneous Field Studies Map MF-654 A (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 130), 1975. 1 sheet, 1 map, 2 ref.

Descriptors: *Soil surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks.

A map indicates depth to bedrock below land surface in the Collinsville quadrangle, Connecticut. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs and wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized highly variable conditions and do not include any weathered (decomposed) bedrock. (Woodard-USGS)
W75-09706

MAP SHOWING DRAINAGE AREAS, LUDLOW QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-503 D (Connecticut Valley Urban Area Project Environmental, Geologic and Hydrologic Studies Contribution 131), 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Drainage area, *Massachusetts, River basins, Watersheds(Basins), Urban hydrology.
Identifiers: *Ludlow(Mass).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the Ludlow quadrangle, Massachusetts. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09707

MAP SHOWING DRAINAGE AREAS, MOUNT TOM QUADRANGLE, MASSACHUSETTS,
Geological Survey, Boston, Mass.
C. J. Londquist.
Miscellaneous Field Studies Map MF-504 B (Connecticut Valley Urban Area Project Environemental, Geologic and Hydrologic Studies Contribution 132), 1975. 1 sheet, 1 map.

Descriptors: *Maps, *Drainage area, *Massachusetts, River basins, Watersheds(Basins), Urban hydrology.
Identifiers: *Mount Tom(Mass).

This map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the Mount Tom quadrangle, Massachusetts. The drainage areas have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Woodard-USGS)
W75-09708

GROUNDWATER LEVELS IN NEBRASKA, 1974,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W75-09710

TEMPERATURES OF STREAMS AND SELECTED RESERVOIRS IN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
H. N. Flippo, Jr.
Pennsylvania Department of Environmental Resources, Harrisburg, Water Resources Bulletin No 11, March 1975. 95 p, 13 fig, 1 tab, 17 ref.

Descriptors: *Water temperature, *Surface waters, *Pennsylvania, Streams, Reservoirs, *Data collections, Natural streams, Thermal water, Electric powerplants, Forecasting, Graphical analysis, Curves.

A summary of water-temperature records includes data collected in water years 1944-70 at 72 stream sites in Pennsylvania. Except for some sites with long-term daily records, sites were chosen primarily to portray natural stream-temperature characteristics throughout the Commonwealth. Water temperatures are summarized by months, years, and for the period of record. Average maximum temperature and monthly cumulative-frequency distributions are presented for the daily records. Approximations of daily mean temperature with 1- and 99-percent probabilities of exceedance can be derived from the frequency distributions of daily temperatures at long-term, data-collection sites. Increases in stream temperatures caused by heated wastewater discharges from industry are usually not more than a few degrees Fahrenheit at distances of more than half a mile below the site of entry. Reservoir level manipulations and powerplant operations often cause much greater alterations to stream temperatures, which persist for many miles. In the Allegheny and Ohio Rivers, the average maximum increase in water temperature due to man's activities is about 4 deg F in a 206-mile reach. (Woodard-USGS)
W75-09713

WATER-RESOURCES INVESTIGATIONS IN THE FORT UNION COAL REGION, NORTH DAKOTA, 1974-75.
Geological Survey, Bismarck, N.Dak.
For primary bibliographic entry see Field 5B.
W75-09715

SUMMARY OF HYDROLOGIC CONDITIONS IN COLLIER COUNTY, FLORIDA, 1973,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W75-09716

THE IMPLEMENTATION OF A HYDROLOGIC DATA PROCESSING SYSTEM IN BRAZIL,
Geological Survey, Reston, Va.
M. D. Edwards.
Project Report, Brazilian Investigations (IR) BR-70, November 1973. 55 p, 6 fig, 2 ref.

Descriptors: *Data storage and retrieval, *Hydrologic data, *Data processing, Computer programs, South America.
Identifiers: *Brazil.

The formats and file structures of the National Water Data Storage and Retrieval System of the U.S. Geological Survey were used in the implementation of the Hydrologic Information System (HIS) in Brazil. In addition to the Daily Values File, the system contains a Station Inventory File which contains pertinent information related to the geographic location, period of record available and types of data available for each station. (Knapp-USGS)
W75-09726

GROUND-WATER DATA FOR ORANGE COUNTY AND VICINITY, TEXAS AND LOUISIANA, 1971-74,
Geological Survey, Houston, Tex.
C. W. Bonnet.
Open-file report, 1975. 25 p, 3 fig, 3 tab, 5 ref.

Descriptors: *Groundwater resources, *Observation wells, *Water levels, *Water quality, *Texas, *Louisiana, Water utilization, Withdrawal, Groundwater, Chemical analysis, Well data, Hydrologic data.
Identifiers: *Groundwater data.

A network of 116 observation wells was maintained for water-level measurements from 1971 to 1974. The area within the network includes Orange County, the southern parts of Jasper and Newton Counties, the eastern part of Jefferson County, the southeastern part of Hardin County, all in Texas; and the western parts of Cameron and Calcasieu Parishes, Louisiana. The heaviest concentration of observation wells is within the industrial area in the southern part of Orange County. A network of 76 wells to observe changes in chemical quality of the groundwater was maintained in Orange County. Data on groundwater pumpage for all major uses during the period 1963-74 also are tabulated. These data are essential to the cause and effect relationships between pumping and the decline in water levels or changes in chemical quality. (Woodard-USGS)
W75-09727

DATA FROM A 1,000-FOOT (305-METRE) CORE HOLE IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. E. Lewis.
Open-file report, May 14, 1975. 16 p, 3 fig, 2 tab, 3 ref.

Descriptors: *Core drilling, *Core logging, *Petrology, *California, Porosity, Hydraulic conductivity, Thermal conductivity, Geophysics, Cores, Sampling, *Data collections.
Identifiers: *Mono County(Calif), Caldera.

Between late September and early November 1973, a 1,000-foot hole was drilled, cored, and logged within the Long Valley caldera, Mono County, Calif. (altitude about 6,980 ft). This report presents data from the core hole and includes geophysical logs, temperature profiles, generalized lithology in the core hole, and results of porosity, hydraulic conductivity, and thermal-conductivity measurements on selected core samples. (Woodard-USGS)
W75-09728

WATER-RESOURCES DATA FOR SKAGWAY, ALASKA,
Geological Survey, Anchorage, Alaska.
G. O. Balding.
Open-file report, 1975. 34 p, 9 fig, 5 tab, 21 ref, 2 append.

Descriptors: *Groundwater, *Water supply, *Water quality, *Alaska, Aquifer characteristics, Hydrologic data, Wells, Sampling, Water yield, Chemical analysis, Groundwater resources, *Data collections.
Identifiers: *Skagway(Alas), Public water supply.

In 1966 an investigation of the alluvial aquifer at Skagway, Alaska, by the U.S. Geological Survey indicated that groundwater of good quality was available at relatively shallow depth. Two production wells were constructed for the town at that time and recently a third well was completed. Water from these wells is a calcium bicarbonate type of excellent chemical quality. The public water supply of Skagway originally was obtained from the hydroelectric catchment system. Water for homes not serviced by this system was obtained from private wells. Water from the hydroelectric storage system is no longer used for drinking water; however, a supply is maintained in the storage tanks for emergency standby and fire protection. Use of private wells within the town limits of Skagway has also been discontinued. This report is a compilation of past and present data concerning the source, availability, and quality of the water that the community has used, has considered using, and is presently using for its domestic supply. (Woodard-USGS)
W75-09729

WIND AND WAVE RELATIONSHIPS IN U.K. COASTAL WATERS,
British Meteorological Office, Brackness (England).
For primary bibliographic entry see Field 2L.
W75-09737

STREAM ORDERING AND CONTOUR MAPPING,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W75-09745

HYDROGEOLOGY OF THE WATERWAYS-WINEFRED LAKE AREA, ALBERTA,
Alberta Research, Edmonton.
For primary bibliographic entry see Field 2F.
W75-09769

WORLD MAPS OF POTENTIAL EVAPOTRANSPIRATION, PLANT DEVELOPMENT, AND SPRING GREENING AND AUTUMN BROWNING OF VEGETATION, BASED ON THE SOLAR THERMAL UNIT MODEL,
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 2D.
W75-09771

MODIFICATIONS TO THE EXECUTIVE COMPUTER PROGRAM FOR STEADY-STATE SIMULATION OF WASTEWATER TREATMENT FACILITIES,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 5D.
W75-09775

A STUDY OF THE SURFACE FLUID FLOW CHARACTERISTICS OF THE NEW YORK BIGHT AND THE DEVELOPMENT OF RESEARCH DATA DISPLAY TECHNIQUES,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-09783

8. ENGINEERING WORKS

8A. Structures

DRAINAGE MATERIALS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
For primary bibliographic entry see Field 8G.
W75-09628

ARCTIC BARRIER FORMATION,
Exxon Production Research Co., Houston, Tex. (assignee)
D. E. Galloway.
US Patent No 3,881,318, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 56, May 6, 1975.

Descriptors: *Patents, *Barriers, Engineering structures, *Breakwaters, *Offshore platforms, Shore protection, Arctic, Sea ice, Ice loads, *Barrier islands.
Identifiers: *Artificial islands(Barriers).

A method and apparatus is described for the construction of multiple artificial islands (barriers) used to prevent the encroachment of pressure ridges, ice islands and sea ice upon offshore structures, marine pipelines or other marine facilities, in regions such as arctic regions, where bodies of water are subject to freezing. Each island structure is anchored to the sea floor by piles and/or the gravity of the structure and spaced from another island a predetermined distance ranging along the seaward side of the facilities to be protected. The predetermined distance between the individual island structures depends upon the design of the facilities that are to be protected and a risk evaluation. The shorter the spacing between individual island structures the sooner the effects of grounding will occur for ice formations that move into the region in the colder seasons. (Sinha-OEIS)
W75-09644

TIDE ENERGY CONVERSION DEVICE,
E. Schmeller.
US Patent No 3,882,320, 3 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 934, No 1, p 361, May 6, 1975.

Descriptors: *Patents, *Tidal powerplants, *Tidal energy, Tidal water, Electric power, Equipment.
Identifiers: Tidal energy conversion.

A tide energy conversion device includes a plurality of spaced apart pairs of parallel endless channel members elongated in the direction of tide flow and facing each other. The members include lower flights that are substantially horizontal and straight. Roller frames, each having two pair of spaced apart rollers, one pair in each channel of a pair of channels, carry elongated blades extending outward and transverse of the channels. These blades are connected to the frames by brace arms, each extending diagonally from the frame to locations adjacent the outer edge of a blade, and by support arms, each connected to an edge of a blade. The channel members are supported on a base which is secured at a level that supports the blades so they are at least partially submerged in the water while they are carried beneath the channels. Endless chains connect the several roller frames. The chains extend over longitudinally-spaced sprockets rotated on shafts. Force of the tide flow against the movable blades rotates the shafts which are connected to electrical generators. Gear reduction and transmission means is provided to enable the generators to produce electricity regardless of the directional movement of the blades. (Sinha-OEIS)
W75-09650

MAN-INDUCED CHANGES OF MIDDLE MISSISSIPPI RIVER,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4A.
W75-09754

MAINTENANCE OF THE FEDERAL NAVIGATION PROJECT IN SCARBORO RIVER AT SCARBORO, MAINE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as EIS-ME-74-0004-F, $4.25 in paper copy, $2.25 in microfiche. January 2, 1974. 66 p, 1 tab, 1 map, 2 append.

Descriptors: *Maintenance, recreation, *Navigable rivers, Sands, Rivers, Channels, Fish, *Maine, Fishing, Recreation facilities, Environmental effects, Marine biology, Disposal, Dredging.
Identifiers: *Environmental Impact Statements, *Scarboro River(Maine).

The proposed action involves the continued maintenance of the federal navigation project in Scarboro River, Scarboro, Maine. Primary maintenance activities will consist of removal of sand from the river and outer channel. Restoration of the navigational channel and anchorage to their authorized depths will benefit commercial fishermen, recreational boaters, and others who depend on safe and adequate navigation facilities. No perdurable adverse environmental effects to the marine ecology of the immediate project area are anticipated. Alternatives are complete, partial, or no maintenance by offshore disposal with bucket dredge, onshore disposal with hydrolic dredge, or sidecast dredge. (Gagliardi-Florida)
W75-09811

INITIAL STAGE, OAHE UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, SOUTH DAKOTA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as EIS-SD-73-1953-F, $12.00 in paper copy, $2.25 in microfiche. December 17, 1973. 496 p, 53 fig, 23 tab.

Descriptors: *South Dakota, *Missouri River, *Irrigation systems, Flood control, Wildlife conservation, Habitat improvement, Recreation, Recreation facilities, Pumping plants, Irrigation canals, Multiple-purpose reservoirs, Drains, Water quality control, Water supply development, Irrigation programs, Wetlands, Wildlife habitats, Drainage effects, Fresh-water marshes, Streamflow, River flow, Community development.
Identifiers: *Environmental Impact Statements, *Lake Oahe(SD).

The Oahe unit will divert water from Lake Oahe to the Missouri River for irrigation of 190,000 acres of land. The project will provide for some flood control, water for municipal use in 17 towns and

cities, fish and wildlife developments at 18 locations and for recreation development at 5 locations. Construction will include an Oahe Pumping Plant, 200 miles of main supply canals, three regulating reservoirs, 1,000 miles of small canals, 935 miles of open drains and 2970 miles of closed drains. The project will enhance farming, create a better quality water supply for municipalities, and increase the number of recreational facilities. One recreational facility will have to be relocated and over 20,000 acres of wetlands will be altered somewhat. The project will have an overall beneficial impact on waterfowl and wildlife by creating new marsh areas, new habitats, and a more stable water supply. Alternatives considered were no development and alternative locations of main supply works or construction of floodways along the James River, and precipitation management. (Altuve-Florida)
W75-09812

DETAILED PROJECT REPORT FOR LOCAL FLOOD PROTECTION, ZACATE CREEK, LAREDO, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 4A.
W75-09813

NORTH FORK NOLIN RIVER WATERSHED, KENTUCKY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as EIS-KY-74-0033-F, $4.25 in paper copy, $2.25 in microfiche. January 4, 1974. 52 p, 2 map, 2 tab.

Descriptors: *Watershed management, *Floodwater, *Flood protection, Erosion, Sediments, Flood plains, Agriculture, Recreation, Water storage, Fish, Lakes, *Kentucky, Sewage treatment, Sewage, Environmental effects, Wildlife, Forestry, Floodproofing, Flood plain zoning, Flood plain insurance, Flood forecasting.
Identifiers: *Environmental Impact Statements, *Larue County(Ky).

The project involves construction of a 34,610 acre watershed in Larue County, Kentucky, and also includes land treatment measures, two single-purpose structures and two multiple-purpose structures for floodwater, recreation and municipal water storage. The project will result in a reduction of erosion rates on uplands and a reduction of floodwater and sediment damages. In addition, the project provides for a 100-year level of flood protection to existing flood plain properties including sewage treatment plants and elimination of raw sewage overflow. Adverse environmental effects include the permanent loss of approximately 294 acres of terrestrial wildlife habitat; the temporary loss of an additional 70 such acres; increasing sediment during construction; modification of the ecological make-up of approximately 12,400 feet of stream; and the interruption of agricultural, forestry and wildlife use on 476 acres. The following alternatives were considered: land treatment, flood proofing, flood plain zoning, flood insurance and flood forecasting; or no action. (Gagliardi-Florida)
W75-09814

EDIZ HOOK BEACH EROSION CONTROL, PORT ANGELES, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-WA-73-0821-F., $4.25 in paper copy, $2.25 in microfiche. August 1972. 60 p, 1 map.

Descriptors: *Washington, *Rocks, *Beaches, *Fish establishment, Boats, Basins, Fish, Environmental effects, Seashores, Quarries, Fish stocking, Sea walls, Washington, Recreation, Fish populations, Fish management, Breakwaters, Groins(Structures), Road construction, Roads.
Identifiers: *Environmental Impact Statements, *Ediz Hook(Wash), *Port Angeles(Wash).

The project involves new rock revetment and beach nourishment of about 10,000 feet of the seaward shore of Ediz Hook, Washington. Material for the revetment would come from existing quarries in the Puget Sound area. Beach nourishment material would come from a source near Port Angeles. The proposed project would provide protection for Port Angeles Harbor, a small boat basin, and access to a Coast Guard Station, and a day-use recreation area. New habitat for rockfish and bottom fish would be created. The primary adverse environmental effect of the project is that the natural appearance of the project area and borrow sites would be altered. Additionally, increased rockfish populations could displace or reduce other fishery resources. The following alternatives were considered: concrete seawalls; off-shore breakwaters; porous walled breakwaters; groin fields; elevated roadways; beach nourishment; removal of man-made structures which impede the natural supply of feed material to Ediz Hook; industrial fill; and no action. (Gagliardi-Florida)
W75-09815

WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR THE LOWER RARITAN RIVER BASIN AND FOR THE SOUTH SHORE OF RARITAN BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W75-09817

PROPOSED NAVIGATIONAL MAINTENANCE DREDGING PROJECT AT GUILFORD HARBOR, GUILFORD, CONNECTICUT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-CT-73-1860-F, $4.25 in paper copy, $2.25 in microfiche. November 28, 1973. 68 p, 3 map, 2 tab.

Descriptors: *Boating, *Recreation, *Dredging, *Shoals, Water quality, Plankton, Harbors, Navigation, *Connecticut, Environmental effects, Boats.
Identifiers: *Environmental Impact Statement, *Guilford Harbor(Conn).

The proposed action involves the maintenance dredging of the Federal navigation project in Guilford Harbor, Connecticut. The project's authorized dimensions will be maintained, thus enabling safe passage and mooring of recreational boats in the harbor. The chief environmental impact of the project will be the dredging and disposal of approximately 70,000 cubic yards of shoal material at the offshore New Haven dump site. Adverse environmental effects include destruction of marine organisms in the dredged spoil areas; temporary degradation of water quality during the work period; and possible detrimental effects of heavy metals leached from the spoil material on the developing eggs and larvae of the plankton in the harbor and on the benthic life at the spoil site. Boating activity and beach recreation might be temporarily interfered with during the work period. Two alternative methods of dredging were considered--hydraulic and bucket dredging. (Gagliardi-Florida)
W75-09821

UPPER MULBERRY RIVER WATERSHED, BARROW, GWINNETT, HALL, AND JACKSON COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from National Technical Information Service, Springfield, Va 22161, USDC, as EIS-GA-74-0005-F, $4.25 in paper copy, $2.25 in microfiche. January 2, 1974. 57 p, 2 chart, 1 tab.

Descriptors: *Watershed management, *Flood protection, *Water storage, Fishing, Economics, Floodwater, Streams, Channels, Flood control, Streamflow, *Georgia, Agriculture, Environmental effects, Forests, Forestry, Wildlife, Fish, Water quality, Turbidity, Channeling, Flood plains, Flood plain zoning.
Identifiers: *Environmental Impact Statements.

The project involves land treatment conservation and construction of seven single-purpose floodwater retarding structures, two multiple-purpose structures, approximately 8,750 feet of selective debris removal from stream channels, approximately 85,675 feet of stream bank protection, and 241 acres of road bank stabilization in Barrow, Gwinnett, Hall and Jackson Counties, Georgia. Favorable environmental impacts include watershed protection, flood prevention, stream bank stabilization, conservation treatment of agricultural and forest land, municipal water storage, increased fishing opportunities, and economic improvement. Adverse environmental effects of the project consist of loss of habitat for wildlife, decreased habitat values in flood storage pools, inundation of stream segments, temporary damage to game and fish habitat from debris removal, and temporary degradation of water quality due to increased turbidity levels during construction and until disturbed streambanks become stabilized. The following alternatives were considered: conservation land treatment alone; conservation land treatment, floodwater retarding structures, and channel enlargement; conservation land treatment and floodwater retarding structures; conservation land treatment and channel improvement; and purchase of flood plain or zoning. (Gagliardi-Florida)
W75-09822

CRUDE OIL AND NATURAL GAS PRODUCTION AND OTHER MINING OPERATIONS IN NAVIGABLE WATERS ALONG THE LOUISIANA COAST (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 5G.
W75-09823

PROPOSED MAINTENANCE DREDGING OF THE CHANNEL FROM U.S. COAST GUARD SANTA ROSA STATION MOORINGS TO NAVIGABLE WATERSHED IN PENSACOLA BAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Coast Guard District (8th), New Orleans, La.
Available from National Technical Information Service, Springfield, Va 22161, USDC, as EIS-FL-73-2010-F, $3.25 in paper copy, $2.25 in microfiche. December 26, 1973. 23 p, 3 fig.

Descriptors: *Dredging, *Channel improvement, *Environmental effects, Channel morphology, Channels, Navigable waters, *Florida, Beaches, Beach erosion, Turbidity, Levees, Benthic fauna, Benthic flora.
Identifiers: *Environmental Impact Statements, *Pensacola Bay(Fla).

The proposed project provides for maintenance dredging of the channel from the moorings at the U.S. Coast Guard Station, Santa Rosa, to navigable waters in Pensacola Bay, Florida. Redredging of the channel will ensure safe operation of Coast Guard boats to carry out search and rescue missions, pollution surveillance and enforcement operations. Disposal of the spoil behind retaining levees along the beach will restore the shoreline to a condition approaching its original state. Dredging will cause temporary turbidity near the operation, but will have very little other adverse effect. Some

benthic organisms will be destroyed, but refaunation will occur. Practical engineering alternatives to the proposed dredging do not exist. The Santa Rosa Regional Planning Council commented to the effect that the operation will cause the destruction of productive marine grass beds. (Denvir-Florida)
W75-09824

PREVENTION AND MITIGATION OF SHORE DAMAGES, KAHULUI HARBOR, MAUI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
Available from National Technical Information Service, Springfield, Va 22161, USDC, as EIS-HI-73-1862-F, $3.75 in paper copy, $2.25 in microfiche. November 28, 1973. 42 p, 3 map.

Descriptors: *Shore protection, *Beach erosion, *Groins(Structure), *Breakwaters, Construction, Construction materials, Shores, Beaches, Hawaii, Sands, Turbidity, Marine fish, Recreation.
Identifiers: *Environmental Impact Statements, *Kahului Harbor, Maui, HI.

The proposed plan for shoreline protection, and beach restoration at Kahului Harbor, Maui, consists of the construction of about 760 feet of revetment along Kahului Beach Road, the placement of about 11,000 cubic yards of sand along the southern shoreline of Kahului Harbor, and construction of one groin extension, two new groins, and one breakwater to protect the sand placements. Construction activities will create some turbidity in the water and disturb fish and marine life to some extent as well as interfere with recreational use. The revetment will prevent continued erosion of the western shoreline and allow safe use of Kahului Beach Road. The sand placement and protective structures will create additional beach which will result in greater recreational use along the southern shore. Alternatives considered were utilization of portions of the plan in combination or singly, or no action. (Denvir-Florida)
W75-09825

ATCHISON, TOPEKA AND SANTA FE RY. CO. V. CALLAWAY (ACTION BY RAILROAD, ENVIRONMENTALISTS AND OTHERS TO HALT RECONSTRUCTION OF LOCK AND DAM ON UPPER MISSISSIPPI RIVER NAVIGATION SYSTEM BY DEFENDANT CORPS OF ENGINEERS).
382 F. Supp. 610-624 (DDC 1974).

Descriptors: *Locks, *Dams, *Mississippi River, *Illinois, Rivers, Navigable rivers, Railroads, Environment, Environmental effects, Environmental control, Navigable waters, Navigation, Rivers and Harbors Act, Water.
Identifiers: *Environmental Impact Statements, Injunctive relief.

The Santa Fe Railway Company and environmentalists brought suit to halt the reconstruction of locks and a dam on the Upper Mississippi River Navigation System, located at Alton, Illinois. On plaintiff's motion for a preliminary injunction, the District Court for the District of Columbia held that, in view of the increased tonnage which the lock would handle and the likelihood that the project was merely the beginning of a complete overhaul of the entire system, the construction required congressional approval. The court found that the Rivers and Harbors Act of 1970 applied to the proposed reconstruction, and that when a federal statute has been violated, the court is not obliged to inquire into traditional requirements for equitable relief before granting an injunction. Because congressional approval had not been given, and the environmental impact statement failed to sufficiently consider the possible environmental effects of the reconstruction of the entire system of locks and dams, the Corps of Engineers was enjoined from taking bids for the proposed reconstruction. (Gagliardi-Florida)
W75-09826

8B. Hydraulics

PROCEEDINGS OF THE SECOND INTERNATIONAL DRIP IRRIGATION CONGRESS.
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-09423

EVALUATION OF HYDRAULICS OF FLOW THROUGH PIPES OF VARYING SLOPES, LENGTHS AND ORIFICE PLACEMENTS,
Udaipur Univ. (India).
M. T. Deshmukh, and M. L. Jain.
In: Proceedings of the Second International Drip Irrigation Congress, p 317-321, (1974). 2 fig, 1 tab, 8 ref.

Descriptors: *Hydraulic design, Agriculture, Irrigation, Hydraulics, Irrigation design, Hydraulic equipment.
Identifiers: *Trickle irrigation, *Drip irrigation.

Polythylene pipes with 1/2 inch diameter and 1/16 inch size perforations have been used to study the hydraulics of flow, under laboratory conditions. The variables considered for study were (i) length of the pipe (ii) spacing of perforations (iii) pipe slope (iv) placement of perforations (facing upward, downward and sidewise) and (v) operating pressure (up to 5 ft.). Three repeated readings have been taken for each test and validity of the results showing relationship of discharge with variables considered has been established with suitable tests. (See also W75-09423) (Skogerboe-Colorado State)
W75-09474

WAVE FORCE COEFFICIENTS FOR CIRCULAR PIERS,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
T. C. Gopalakrishnan, and H. Raman.
Indian Journal of Technology, Vol 12, No 11, p 485-488, November 1974. 5 fig, 1 tab, 5 ref, 1 append.

Descriptors: *Waves(Water), *Drag, *Piers, Wavelengths, Offshore platforms, Hydraulics, Hydraulic models, Ocean waves, Structural behavior, Structural design, Hydrodynamics.
Identifiers: *Inertia, *Circular piers, Morison equation, Phase angles, Wave steepness, Impact pressures.

An experimental procedure was developed to determine the values of two hydrodynamic coefficients, i.e., the drag and inertia coefficients, which are required for the determination of wave forces on circular piers by the Morison equation. By adopting this procedure, the coefficients can be plotted as a function of wave phase angle and wave steepness. (Lee-ISWS)
W75-09593

THE KARMAN AND REYNOLDS NUMBERS AND THE DRAG COEFFICIENT IN DUCTS AND PIPES,
M. S. Fomichev, N. T. Fazullin, and A. V. Popov.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 1-8, November-December 1974. 5 fig, 17 ref.

Descriptors: *Fluid mechanics, *Fluid friction, *Mathematical studies, Pipe flow, Ducts, *Reynolds number, Flow resistance, Hydraulics, Flow characteristics, Equations, Analysis.
Identifiers: *Karman number, Emperical equations, Pulsating flows.

Reynolds equations were used as the point of departure for deriving similitude criteria of averaged and pulsational flows. The functional relationship was established between the Karman numbers for the amplitude of velocity fluctuations; the Reynolds, Froude, and Euler numbers; and the hydraulic drag coefficient. Empirical expressions obtained relating the pulsational flow features to the drag coefficient were the average Karman number K sub u = 0.447(square root of drag coefficient) and the average Karman number K sub v = 0.224(square root of drag coefficient). (Humphreys-ISWS)
W75-09596

DRAG REDUCTION BY COLLAPSED AND EXTENDED POLYELECTROLYTES,
Indian Inst. of Tech., Madras. Dept. of Chemical Engineering.
P. S. Virk.
Nature, Vol 253, No 5487, p 109-110, January 10, 1975. 2 fig, 6 ref.

Descriptors: *Pipe flow, *Flow characteristics, *Laboratory tests, Drag, Flow friction, Additives, *Polyelectrolytes, Aqueous solutions, Polymers, Hydraulics, Flow resistance.
Identifiers: Drag reduction.

Laboratory experiments on drag reduction in a pipe (0.945-cm diameter and 189-cm long) with saline solutions of a partially hydrolyzed polyacrylamide (PAMH) showed the effect of macromolecule conformation. The extreme collapsed and extended PAMH conformations also simulated the deportment of linear random-coiling macromolecules in solution and of high aspect ratio fibres in suspension; and they indicate a possible relationship between the mechanisms of drag reduction produced by these additives. Results obtained with collapsed and extended polyelectrolyte possibly represent two extremes of drag reduction behavior, one (Type A) which is characteristic of flexible, random-coiling, deformable additives and the other (Type B) which is characteristic of relatively rigid, elongated, undeformable additives. Idealized, a family of Type A solutions yield polymeric regime segments fanning outwards from a common onset point on the Prandtl-Karman line with slopes increasing with increasing additive concentration and drag reduction increasing with increasing values of Reynolds number times square root of friction factor. A family of Type B solutions yield polymeric regime segments coming off the maximum drag reduction asymptote at characteristic retro-onset points and lying roughly parallel to but displaced upwards from the Prandtl-Karman line with drag reduction essentially independent of Reynolds number times square root of friction factor but increasing with increasing additive concentration. (Humphreys-ISWS)
W75-09601

COMPUTATION OF WAVE HEIGHTS DUE TO REFRACTION AND FRICTION,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
O. Skovgaard, I. G. Jonsson, and J. A. Bertelsen.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW1, Proceedings Paper 11100, p 15-32, February 1975. 7 fig, 2 tab, 31 ref, 2 append.

Descriptors: *Waves(Water), *Ocean waves, *Coastal engineering, *Friction, *Refraction(Water waves), Gravity waves, Energy, Height, Equations, Numerical analysis.
Identifiers: *Surface waves.

The equations for the wave orthogonals and the wave heights were presented for depth refraction of regular, long-crested, small amplitude surface gravity waves over an arbitrary bottom, using time as the independent variable. The effect of turbulent bottom friction on the wave height was included. The computer outputs were in the form of

automatically plotted wave orthogonals with the wave heights written at discrete points along these paths. Systematic tests were presented for water areas with straight and parallel bottom contours. The errors inherently connected with the introduction of a grid plus a set of formulas for differentiation and interpolation were examined for a horizontal bottom with an infinite, long, sinusoidal threshold. For one plane-sloping bottom, information was given for the influence of the initial curvature of the wave front, bottom roughness, and initial wave height. (Bhowmik-ISWS)
W75-09606

WAVE INDUCED PRESSURES IN PERMEABLE SEABEDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
H. Moshagen, and A. Torum.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW1, Proceedings Paper 11099, p 49-57, February 1975. 6 fig, 8 ref, 2 append.

Descriptors: *Waves(Water), *Oceans, *Porous media, *Pressure, *Soils, Erosion, Stability, Harbors, Construction, Underwater.
Identifiers: *Ocean bottom.

Results of a theoretical investigation on the transmission of wave-induced pressures into a permeable sea bottom were reported. In the model it was assumed that the soil water is compressible and the grain skeleton remain rigid. It was postulated that the resulting theoretical model should describe an effective mechanism by which soil permeability affected the pressure transmission. (Bhomik-ISWS)
W75-09607

COMPUTATION OF FLOW THROUGH MASONBORO INLET, N.C.,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W75-09608

INITIAL BIFURCATION PROCESS IN NATURAL CHANNEL NETWORKS,
New South Wales Univ., Kensington (Australia). School of Geography.
A. D. Abrahams.
Geology, Vol 3, No 2, p 307-308, June 1975. 1 fig, 4 ref.

Descriptors: *Channel morphology, *Geomorphology, *Networks, Natural streams, Alluvial channels, Channels, Channel erosion, Streams, Drainage systems.
Identifiers: *Bifurcation process, *Channel geometry, Stream order system, Stream links.

Analyses of cis and trans links located near the margins of 73 miniature channel networks that are incising and expanding headward into the surface of a valley fill suggest that the initial bifurcation process generates the same number of cis and trans links, but confers on them different length distributions. (Lee-ISWS)
W75-09609

CORRUGATED PLASTIC DRAIN TUBING USED AS UNDERGROUND CONDUIT,
Missouri Univ., Columbia. Dept. of Agricultural Engineering.
M. K. Misra, and R. P. Beasley.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 2, p 260-262, March-April 1975. 7 fig, 2 tab, 2 ref.

Descriptors: *Drains, *Drainage systems, *Excess water(Soils), *Hydraulic models, Drainage practices, Pipes, Storm drains, Drainage water, Tiles, Conduits, Subsurface drains, Drainage, Sediment transport, Soils, Movement, Sediments.
Identifiers: *Plastic drain tubing, *Corrugated drain tubing, Soil tanks.

Model studies were made to investigate the effect of high water velocity on the extent of soil movement when corrugated plastic drain tubing is used as conduits for underground terrace outlets on steep slopes. No significant amount of sediment was drawn into the tubing, even when the slope was 10% and velocity approached 9 ft per sec. The magnitude of the flow from the tubing to the soil was low in cohesive soils. But, with less cohesive soils this outflow was greater and there was considerable movement of soil from around the tubing. (Sanderson-ISWS)
W75-09611

TANGENTIAL STRESS DISTRIBUTION IN TURBULENT BOUNDARY LAYERS AT AN ADVERSE PRESSURE GRADIENT,
Moskovskii Energetichskii Institut (USSR). Dept. of Steam and Gas Turbines.
V. G. Kalmykov, A. N. Sherstyuk, and T. V. Shul'gina.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 9-14, November-December 1974. 3 fig, 1 tab, 5 ref.

Descriptors: *Turbulent boundary layers, *Fluid mechanics, *Mathematical studies, *Flow characteristics, Analysis, Spatial distribution, Velocity, Stress, Equations, Approximation method.
Identifiers: Tangential stress distribution, Adverse pressure gradient, Prandtl law.

An approximate solution based on the Prandtl law was presented of the problem of tangential stress distribution in turbulent boundary layers with adverse pressure gradients. It was shown that higher-order derivatives should not be incorporated in determining the law of tangential stresses. Comparison with experimental data points to satisfactory accuracy of the method is separationless flow. (Humphreys-ISWS)
W75-09738

ON THE DISCHARGE COEFFICIENT OF NOZZLES FOR SINGLE- AND TWO-PHASE FLUIDS,
Urals Polytechnic Inst., Sverdlovsk (USSR). Hydraulics Div.
V. A. Doroshenko.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 52-56, November-December 1974. 4 fig, 13 ref.

Descriptors: *Discharge coefficient, *Nozzles, *Laboratory tests, Pipes, Flow, Flow rates, Measurement, Hydraulics, Testing.
Identifiers: *Two-phase flow, Gas-liquid mixture, Water-air mixture.

Experimental data were obtained for the discharge coefficient of standardized nozzles with water and air-water mixtures with volumetric gas concentrations from 10 to 40%. A marked difference was found between experimental data and values recommended by the 1964 Soviet regulations, particularly in the range of low Reynolds numbers and small nozzle modulus (discharge cross section). Additional investigations are needed for working out final recommendations. Standardized nozzles can also be used for determining the volumetric flow rates of gas-liquid mixtures because the data for the flow rate of mixtures with any gas content and pressure drop across the nozzle fit on parabolic curves. (Humphreys-ISWS)
W75-09739

A SPECIFIC CASE OF WAVE MOTION OF A LIQUID IN PIPES,
Ye. M. Khatkovskiy.
Fluid Mechanics - Soviet Research, Vol 3, No 6, p 57-63, November-December 1974. 2 fig, 7 ref.

Descriptors: *Water hammer, *Theoretical analysis, *Hydrodynamics, Analytical techniques, Mathematical studies, Equations, *Pipe flow, Pressure, Velocity, Pipes, Continuity equation, Waves(Water).

A case was considered of inception of wave processes in a pipe resulting from changing the pressure at one of its ends and connecting a hydraulic tank at the other. The problem was considered by taking into account the liquid viscosity. By solving differential equations of continuity and motion, general expressions were obtained for the pressure and velocity of the liquid. These expressions can be used to calculate the pressures and velocities in any sections of the pipeline at any time. (Humphreys-ISWS)
W75-09740

FRICTION FACTOR UNDER OSCILLATORY WAVES,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
J. W. Kamphuis.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of American Society of Civil Engineers, Vol 101, No WW2, Paper 11292, p 135-144, May 1975. 9 fig, 11 ref, 2 append.

Descriptors: *Coastal engineering, *Roughness coefficient, *Shear stress, *Waves(Water), *Laboratory tests, Flow rates, Sediment transport, Boundary layers, Turbulent flow, Laminar flow, Friction.
Identifiers: *Oscillatory waves, Stanton diagrams, Nikuradse sand grain roughness.

Tests were performed in an oscillating water tunnel to determine the relationships between wave parameters and resulting bottom friction and shear stresses. The test results were presented in Stanton-type wave friction factor diagrams and the results were compared with existing semitheoretical expressions. The wave friction factor in the laminar, the smooth, and the rough turbulent regimes was defined. Some caution must be used when applying the postulated friction factor in the transition region. (Singh-ISWS)
W75-09755

RAPID TEMPERATURE REDUCTION OF THERMAL DISCHARGE,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-09757

STATISTICAL PROPERTIES OF WAVE FORCE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
C. C. Tung.
Journal of the Engineering Mechanics Division, Proceedings of American Society of Civil Engineers, Vol 101, No EM1, Paper 11116, p 1-11, February 1975. 2 fig, 9 ref, 2 append.

Descriptors: *Waves(Water), *Statistics, *Piers, *Oceans, *Energy, Profiles, Marinas, Structures, Mechanical engineering.
Identifiers: *Wave forces, *Standard deviations, *Vertical cylinders.

Expressions of the mean and standard deviation of wave force on vertical cylinder in a random field were derived. Wave force was evaluated according to Morison's formula and the sea surface was assumed to be Gaussian. The effects of free surface fluctuation were included. The mean and standard deviation were computed and results were presented graphically. It was shown that the mean of wave force is nonzero. The standard deviation of wave force deviated drastically from that when the free surface fluctuation

phenomenon was ignored, especially in the vicinity of the mean water level. Since most of the water movements are around and above the mean water level where the foregoing observed discrepancy was most pronounced, it was concluded that the effects of the free surface fluctuation phenomenon on wave force has important implications on the design considerations of marine structures that protrude above the mean water level. (Bhowmik-ISWS)
W75-09759

8C. Hydraulic Machinery

SEWAGE TREATMENT PLANT DEPENDABILITY WITH SPECIAL REFERENCE TO THE ACTIVATED SLUDGE PROCESS,
National Field Investigations Center-Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09393

CONTROL SCHEMES FOR THE ACTIVATED-SLUDGE PROCESS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W75-09395

CHAMBER METHOD FOR DRIP IRRIGATION SYSTEM DESIGN AND INSTALLATION PROCEDURE,
Massachusetts Univ., Amherst.
E. S. Pira.
In: Proceedings of the Second International Drip Irrigation Congress, p 121-126, (1974). 4 fig, 2 tab, 2 ref.

Descriptors: *Head loss, *Design criteria, *Irrigation design, Irrigation methods, Flow rates, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

High pressure water is supplied through a 'quick-fill' and pressure reducing device to a low pressure chamber. A minimal pressure drop in the chamber produced a relatively uniform discharge rate from the drippers. Practical field installations based on laboratory tests, field tests and simulation model are discussed. System design criteria, components, materials, detailed illustrations and installation procedures are presented. (See also W75-09423) (Skogerboe-Colorado State)
W75-09441

REVERSE FLUSHING TECHNIQUE FOR BI-WALL DRIP TUBING,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
S. L. Rawlins.
In: Proceedings of the Second International Drip Irrigation Congress, p 209-211, (1974). 2 fig.

Descriptors: *Clogging, Irrigation, Agriculture, Irrigation systems.
Identifiers: *Trickle irrigation, *Drip irrigation, *Bi-wall tubing, *Reverse flushing.

Particles carried in the irrigation water first lodge in the inside orifices between the supply and emission chambers of biwall drip tubing. These can be effectively dislodged by briefly applying water at high pressure to the emission chamber. They can then be flushed from the supply chamber in the usual manner. Because the burst pressure of tubing varies inversely with its diameter, the small emission chamber can withstand considerably higher pressures than can the supply chamber. Results of tests using this technique are discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09455

TRICKLE IRRIGATION IN MICHIGAN ORCHARDS: CONTROLLING RATE OF FLOW WITH FLOW REGULATING VALVES AND MICROTUBES,
Michigan State Univ. Lansing.
A. L. Kenworthy, and C. Kesner.
In: Proceedings of the Second International Drip Irrigation Congress, p 275-280, (1974). 3 fig, 2 tab, 2 ref.

Descriptors: *Flow rates, *Michigan, Irrigation systems, Orchards, Irrigation, Agriculture, Valves, Control.
Identifiers: *Trickle irrigation, *Drip irrigation, *Microtubes, *Flow regulating valves, Flow regulation.

An appropriate combination of flow regulating valves and microtubes of different inside diameter has been found ideal for studying rates of flow in trickle irrigation. The flow regulating valve is installed in a row lateral. Capacity of the valve is selected to provide the amount of water desired for the row. To distribute the water and counter elevation changes, microtubes of different inside diameters are used and thus avoid excessive microtube lengths. Selection of an appropriate microtube ID in accordance to flow rate will permit a uniform value to adjust microtube length according to elevation change. Data on uniformity of water distribution is presented. (See also W75-09423) (Skogerboe-Colorado State)
W75-09467

HYDRAULICS OF SINGLE-CHAMBER VS. DUAL-CHAMBER TUBING,
Hawaiian Agronomics, Inc., Honolulu.
C. M. Vaziri.
In: Proceedings of the Second International Drip Irrigation Congress, p 293-298, (1974). 2 tab.

Descriptors: *Hydraulic design, Hydraulic properties, Hydraulics, *Irrigation design, Irrigation system, Irrigation, Agriculture.
Identifiers: *Trickle irrigation, *Drip irrigation.

The basic hydraulic relationship of pressure, orifice diameter, coefficient of discharge, and the friction loss along a tube is a necessity before one can design an adequate drip or subsurface irrigation system. There are several types of tubing and emitters available. But the most unique difference hydraulically is the single chamber tubing versus a dual chamber tubing. The single chamber tube is found to provide an acceptable range of orifice flow uniformity from the head of tubing to the end for approximately 300' of length. Beyond this reach the friction loss in the 1/2' polyethylene tubing is excessive and causes a reduction in the orifice flow rate. The flow rate through each plastic orifice is proportional to the square root of the pressure inside the tubing at the orifice point. The other type of tubing that has been experimented with is dual chamber tubing. One chamber is for the conveyance. This in turn is connected to the outside chamber (the distribution tube) and water is emitted to the outside through desired orifice spacing, depending on soil types and plantings. Equations are developed to describe the flow pattern for dual chamber tubing and the relationship between the inner and outer chamber. The effect of orifice diameters and orifice spacing on the outer chamber pressure is discussed. (See also W75-09423) (Skogerboe-Colorado State)
W75-09470

DESIGNING TRICKLE IRRIGATION LATERALS FOR UNIFORMITY,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 3F.
W75-09471

DESIGN CHARTS FOR DRIP IRRIGATION SYSTEMS,
Hawaii Univ., Honolulu.
I. P. Wu, and H. M. Gitlin.
In: Proceedings of the Second International Drip Irrigation Congress, p 305-310, (1974). 3 fig, 4 ref.

Descriptors: *Irrigation design, *Design flow, *Design criteria, *Hydraulic design, Hydraulics, Irrigation systems, Irrigation, Agriculture, Design.
Identifiers: *Trickle irrigation, *Drip irrigation.

A simple design procedure has been developed for drip irrigation systems installed on either uniform or non-uniform slopes. The charts presented can be used to design a system with an allowable discharge (emitter) variation up to 20%. A dimensionless energy gradient curve has been developed theoretically for drip irrigation lines, submain and lateral, and was checked by laboratory and field experiments. It was found that a typical dimensionless energy gradient curve which was developed by using turbulent flow in smooth pipe can be used for flow conditions having 20% discharge (emitter) variation and percentage of laminar flow up to 30%. The dimensionless energy gradient curve combined with different slope conditions will show the pressure variation along the drip irrigation line. Design charts have been developed for both single tubing and twin-chamber drip irrigation systems. Examples are presented showing the design procedure. (See also W75-09423) (Skogerboe-Colorado State)
W75-09472

HYDRAULIC AND MECHANICAL PROPERTIES OF DRIPPERS,
Israel Center of Water Works Appliances, Tel-Aviv.
Y. Gilaad, L. Krystal, and K. Zanker.
In: Proceedings of the Second International Drip Irrigation Congress, p 311-316, (1974). 1 tab.

Descriptors: *Hydraulic properties, *Hydraulic equipment, *Hydraulic design, *Mechanical properties, Hydraulics, Agriculture, Irrigation.
Identifiers: *Trickle irrigation, *Drip irrigation, *Trickle irrigation, Emitters.

Research is discussed dealing with the hydraulic, mechanical, and functional requirements of the various types of emitters available based on hydraulic tests performed and experience accumulated in the field. The following hydraulic properties have a direct influence on the operation of drippers: the relationship between flow rate and pressure, resistance to the flow of water in the tubing at the place of insertion of the dripper, and shape and size of the water passage in the dripper. (See also W75-09423) (Skogerboe-Colorado State)
W75-09473

DESIGN CRITERIA FOR MECHANICAL, ELECTRIC, AND FLUID SYSTEM AND COMPONENT RELIABILITY, SUPPLEMENT TO FEDERAL GUIDELINES FOR DESIGN, OPERATION, AND MAINTENANCE OF WASTE WATER TREATMENT FACILITIES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402, Price $0.85. Technical Bulletin EPA-430-99-74-001, (1974). 54 p.

Descriptors: *Design criteria, *Municipal wastes, Discharges, Navigable waters, Federal jurisdiction, Guidelines, Legislation, Potable water, Effluents, Hydraulic capacity, Pipes, Maintenance, *Treatment facilities, *Waste water treatment.
Identifiers: Mechanical systems, Electrical system, Fluid systems.

As a supplement to the federal guidelines on design, operation, and maintenance of waste water treatment facilities, this document details design criteria for municipal waste water treatment works. Minimum standards are given for reliability for mechanical, electric, and fluid systems and components. These criteria are necessary for

design of waste water treatment facilities seeking Federal financial assistance under PL 92-500. Definitions of such terms as component, controlled diversion, design flow, effluent limitation, hydraulic capacity, navigable waters, and reliability are given. Three classes of treatment works are works which discharge into navigable waters that could be permanently or unacceptably damaged by effluent in only a few hours (near reservoirs for potable water or areas of shellfish); those which discharge into navigable waters which migh be damaged by continued (over several days) effluent quality degradation (such as recreational waters); and works not included in the previous two. Design criteria are detailed, regarding: works locations; provisions for expansion or upgrading; piping requirements; pipes subject to clogging; pipe draining provisions; feed line maintenance and repair; component access space, repair, and handling; and essential services. Systems design criteria are enumerated, and include the electric power system, instrumentation, and sludge handling systems. (Prague-FIRL)
W75-09559

IDENTIFICATION OF PROBLEM AREAS IN WATER POLLUTION CONTROL PLANTS,
Ontario Ministry of the Environment, Toronto.
For primary bibliographic entry see Field 5D.
W75-09564

WATER FOR ENERGY SELF-SUFFICIENCY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-09626

WATER FOR ENERGY SELF-SUFFICIENCY, EXECUTIVE SUMMARY.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4C.
W75-09627

SPECIAL POWER GENERATING UNIT USING CPMPRESSED AIR PRODUCED BY OCEAN WAVE TOGETHER WITH SUPER-HEATED STEAM,
K. Yamada.
US Patent No 3,879,950, 4 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 933, No 5, p 1964, April 29, 1975.

Descriptors: *Patents, *Electric powerplants, *Ocean waves, Offshore structures, Energy conversion, Coasts, Steam, Turbines.
Identifiers: Energy storage, Compressed air, Superheated steam.

The invention provides a special seashore or offshore electric power generating unit using compressed air together with superheated steam, which stores mechanical energy in the form of compressed air during off-peak load periods by using superfluous output of the power plant and ocean wave energy. The power plant regenerates electric energy during peak-load periods by using the compressed air thus stored. The compressed air is heated to the temperature of the superheated steam to be mixed therewith, prior to the delivery to a turbine for driving an electric generator. To fully utilize the ocean wave energy, a stationary platform is provided above the sea level, and stationary parts of a number of air compressors are secured to the platform, while movable parts of the air compressors are secured to floats which are placed on the water level so as to move up and down, in response to the wave motion of the sea water. Thus, the movable portions of the air compressors are driven by the ocean wave motion, so that air at the atmospheric pressure is compressed to a higher pressure level by the compressors. (Sinha-OEIS)
W75-09638

TABLE ROCK LAKE, WHITE RIVER, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Little Rock, Ark.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-MO-73-1469-F, $4.25 in paper copy, $2.25 in microfiche. September 7, 1973. 54 p, 1 map.

Descriptors: *Hydroelectric power, *Hydroelectric plants, *Flood control, Fish genetics, Vegetation, *Arkansas, Lakes, Powerplants, Parks, Land resources, Water resources, Water resources development, Pollutants, Thermal pollution, Air pollution, Environmental effects.
Identifiers: *Environmental Impact Statements, *Table Rock Lake(Ark).

The proposed operation and maintenance of Table Rock Lake, Arkansas includes hydroelectric power generation, flood control, operation and maintenance of parks, and management of land and water resources. The needed electrical energy is produced without air or thermal pollution, but creates a downstream environment dependent upon cold water releases. Accompanying lake fluctuations change the environment along the shoreline with respect to fish spawning and vegetation survival. These lake fluctuations that adversely affect vegetation along the shoreline and fish in the lake are the primary adverse environmental effects of the project. The alternatives to the present activities would be modification or total cessation of hydroelectric power generation, flood control, and different management practices. (Gagliardi-Florida)
W75-09818

8D. Soil Mechanics

PORE AND ERODING FLUID INFLUENCES ON SURFACE EROSION OF SOIL,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-09741

EFFECTS OF DEFORESTATION ON SLOPES,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W75-09743

WATER ESCAPE STRUCTURES IN COARSE-GRAINED SEDIMENTS,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-09768

CHARLES RIVER DAM, BOSTON, MASS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-MA-73-1612-F, $5.75 in paper copy, $2.25 in microfiche. October 11, 1973. 127 p, 3 fig, 2 tab.

Descriptors: *Dams, *Earth dams, *Concrete dams, *Locks, *Fish ladders, Recreaction, Flood protection, Fish, *Massachusetts, Aesthetics, Flood control, Rivers, Pumping, Pumping plants, Navigation, Flood damage, Boats, Water quality, Diversion, Fish passages, Environmental effects, Disposal, Reservoir storage, Dikes.
Identifiers: *Environmental Impact Statement, *Charles River(Mass).

The proposed action entails construction of a multiple-purpose earth and concrete dam with river pumping facilities, three navigation locks, and a fish ladder on the Charles River, Massachusetts. The project will enhance the aesthetic and recreational potential of the area, provide a flood-free environment, eliminate extensive flood losses, improve movement of boat traffic, enhance water quality in the Charles River Basin, and improve fish passage. The adverse environmental effects of the action will consist of temporary inconvenience during construction and offshore disposal of polluted material removed for site preparation. The following alternatives were considered: upstream reservoir storage, perimeter diking, diversion, improved pumping vailities, improved locking facilities in the existing dam, or no action. (Gagliardi-Florida)
W75-09816

BUSHLEY BAYOU, LOUISANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Vicksburg, Miss.
Available from the National Technical Information Service, Springfield, Va. 22161, USDC, as, EIS-LA-73-1528-F, $4.75 in paper copy, $2.25 in microfiche. September 20, 1973. 88 p, 6 map.

Descriptors: *Flood protection, *Levees, *Floodgates, *Canals, Wildlife management, Water supply, Water control, Backwater, Flooding, Floods, Flood control, Louisiana, Drainage, Pumping plants, Pumping, Pumps, Wildlife, Wildlife habitats, Fish, Headwaters, Drainage, Environmental effects, Forests, Hardwood, Archaeology, Streams, Flood forecasting, Flood plains.
Identifiers: *Environmental Impact Statements, *Bushley Bayou(LA).

The project is designed to determine the advisibility of providing backwater flood protection to the Bushley Bayou, Louisiana, area by means of a loop levee, gravity floodgate, internal drainage canal, and a 1,500 cubic-foot-per-second pumping station. The acquisition of 3,000 acres of suitable wildlife land, water supply and control facilities was recommended as a measure to mitigate project-induced fish and wildlife losses. The proposed action will make feasible headwater flood protection and more efficient drainage of the protected area. Adverse environmental effects of the project include the loss of 5,900 acres of bottomland hardwood forest, the reduction in extent and quality of fish and wildlife habitat, and possible damage to Indian mounds of archaeological value. Levee alignment with the floodway to intercept hill stream headwater flood flows; a levee and floodgate without pumping plant; a flood forecasting and warning system; flood plain regulation; permanent evacuation of the flood plain were considered alternatives. (Gagliardi-Florida)
W75-09819

8E. Rock Mechanics and Geology

DATA FROM A 1,000-FOOT (305-METRE) CORE HOLE IN THE LONG VALLEY CALDERA, MONO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-09728

8G. Materials

CORRUGATED PLASTIC DRAIN TUBING USED AS UNDERGROUND CONDUIT,
Missouri Univ., Columbia. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W75-09611

DRAINAGE MATERIALS.
Food and Agriculture Organization of the United Nations, Rome (Italy). Working Party on Water Resources and Irrigation.
Food and Agriculture Organization of the United Nations, Water Resources and Development Service, Rome, Irrigation and Drainage Paper No 9, 1972. 122 p.

Descriptors: *Drainage, *Drainage engineering, *Tile drainage, *Land reclamation, *Europe, Drainage effects, Drainage practices, Drainage systems, Construction equipment, Dewatering, Lateral conveyance structures, Tiles, Clay pipes, Conduits, Pipes, Plastic pipes, Tile drains, Filters, Soil filters, Screens, Agriculture, Arid lands, Economics.
Identifiers: *Drainage materials, France, The Netherlands, Belgium, Federal Republic of Germany, Hungary, United Kingdom.

This collection of seven essays reviews experiences with drainage materials in The Netherlands, Belgium, France, the Federal Republic of Germany, Hungary, and the United Kingdom. Various types of pipes and filters are considered. Since drainage is a frequent problem in the irrigation districts of arid lands, the papers are pertinent to environments radically different from Western Europe. In the past, drainage materials were manufactured near their place of use. Increasingly, however, such materials are being imported; thus, it is becoming imperative that international standards on pipe sizes, etc., be set to make such equipment compatible. Also, in a world of rising energy prices, information on manual versus mechanical costs in laying out drainage systems has growing pertinence, particularly in the underdeveloped arid regions. (See W75-09629 thru W75-09634) (Bowden-Arizona)
W75-09628

SURVEY OF EXPERIENCE WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Rijksstation voor Landbouwtechniek, Merelbeke (Beligium).
R. Deckx, A. Maton, and W. Dierickx.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 27-34, 1972. append.

Descriptors: *Specifications, Design standards, *Drainage engineering, Europe, *Clay pipes, *Plastic pipes, *Tile drainage, *Land reclamation, Drainage, Pipes, Filters, Soil filters, Construction equipment, Arid lands, Irrigation, Costs, Reviews.
Identifiers: *Drainage materials, *Belgium.

Three drainage materials used in Belgium, but also very applicable in more arid lands where drainage and irrigation practices are directly linked, are discussed. The materials considered (plastic pipes, pipes of baked clay, and enveloping materials) are supplied in Belgium by Germany or the Netherlands. In Belgium smooth plastic pipes were introduced with a glass fiber sheet as enveloping material but never replaced the more traditional baked clay pipes because of occasional inferior quality. Corrugated pipes have aroused much interest of late, and because of their competitive prices, have the chance of replacing clay pipes. Statistical information is provided about pipe measurement, and resistance to compression and shock; some general characteristics of smooth plastic pipes and pipes baked in clay are described. Glass fiber sheet, glass wool and flax band are compared in their effectiveness as enveloping materials. (See also W75-09628) (Bowden-Arizona)
W75-09629

STUDY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF SPECIFICATIONS AVAILABLE IN FRANCE,
Centre National d'Etudes Techniques et de Recherches Technologiques pour l'Agriculture, les Forets et l'Equipment Rural, Antony (France).
J. Dunglas.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 35-40, 1972.

Descriptors: *Specifications, Design standards, *Drainage, *Drainage engineering, Europe, *Clay pipes, *Land reclamation, *Construction equipment, Pipes, Clay pipes, Plastic pipes, Filters, Intakes, Dewatering, Tile drainage, Arid lands, Irrigation, Economics, Machinery, Reviews.
Identifiers: *France, *Drainage materials.

France has no national specifications on drainage materials because natural conditions are too diverse and the finding of test and experiments in progress are too uncertain. Results of tests made in the laboratory and under field conditions are presented, showing that smooth plastic pipes promote better water flow than corrugated pipes; wider drain slots are advantageous because they diminish intake resistance but dangerous because they accelerate the entry of fine soil particles into the pipe; and the use of filtering material to envelope drain pipes reduces the amount of sediment build-up in the pipes and prevents the washing away of the soil surrounding the pipes. Pipes, field and pipe-laying equipment and drainage plans made are described. Many of the problems and conditions discussed have value not only for terrains similar to those in France, but can also be applied to more arid areas. (See also W75-09628) (Bowden-Arizona)
W75-09630

EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Kuratorium fuer Kulturbauwesen, Hanover (West Germany).
H. Billib.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 41-48, 1972. 6 tab, 6 ref.

Descriptors: *Specifications, Design standards, *Drainage, *Drainage engineering, *Filters, *Clay pipes, *Land reclamation, Europe, Pipes, Agriculture, Tiles, Plastic pipes, Lateral conveyance structures, Backfill, Irrigation, Arid lands, Mole drainage, Reviews.
Identifiers: *Drainage materials, Germany, *Federal Republic of Germany.

Clay and corrugated plastic pipes have replaced fascines, wooden boxes and concrete pipes in western European drainage practices. Detailed information on pipe sizes and costs are presented in table form, and pipe line fittings and filters are also discussed. Techniques for backfilling drainage ditches are given for several different soil types, thus making the information relevant not only to the drainage areas in western Europe but also to the drier areas of the earth where similar techniques are practiced for irrigation and the associated drainage. (See also W75-09628) (Bowden-Arizona)
W75-09631

A SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND A REVIEW OF AVAILABLE SPECIFICATIONS,
Vizgazdalkodasi Tudomanyos Kutato Intezet, Budapest (Hungary).
L. Szabo, and B. Szekrenyi.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 49-53, 1972. 2 figs.

Descriptors: *Specifications, Design standards, *Drainage, *Drainage engineering, *Clay pipes, *Plastic pipes, *Filters, Europe, *Land reclamation, Pipes, Agriculture, Construction equipment, Economics, Costs, Irrigation, Arid lands, Mole drainage, Lime, Reviews.
Identifiers: *Drainage materials, *Hungary.

Terra cotta drainage pipes are widely used in Hungary. Drainage systems failed to expand between the two World Wars, and only in recent decades has the construction of new drainage systems begun. Drainage work currently being undertaken is mainly in regions of brown forest soils of pseudo-gley and clay-flush which have been damaged by residuary, stagnant surface waters. In the case of mole drainage, gravel is used as a filtering material. According to Hungarian specifications, the gravel used as filter material should not contain clay, silt, iron, or ochre fractions. Test results are given from experiments carried out on various filtering materials and lime treatment of the drain-trench soil. Drainage of soils with heavy mineral contents whould be concurrent with deep loosening and mole drainage to improve the water handling of the soil and to reduce costs. These techniques are valuable not only in areas with terrain similar to that in Hungary, but to more arid areas. (See also W75-09628) (Bowden-Arizona)
W75-09632

DRAINAGE MATERIALS - PROVISIONAL REPORT OF THE EXPERIENCE GAINED IN THE NETHERLANDS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
J. Wesseling, and C. L. van Someren.
In: Food and Agriculture Organization of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 55-84, 1972. 12 fig, 10 tab, 33 ref.

Descriptors: *Specifications, Design standards, *Drainage, *Drainage engineering, *Europe, *Tile drains, *Clay pipes, Pipes, Soil filters, Agriculture, Tile drainage, Irrigation, Arid lands, Economics, Costs, Hydrologic properties, Backfill, Reviews.
Identifiers: *Drainage materials, *Netherlands.

Modern agriculture, especially in arid regions, requires well-drained areas. Surface drainage systems which make use of furrows and ditches have to be replaced by subsurface systems. New machines and new materials have opened new possibilities for the application of subsurface systems. The major question is just what properties drainage materials must have to ensure a good drainage system. The larger the drainage pipe the better the drainage will be; however, large pipes increase the cost of the system. Opinions differ as to the necessary minimum gap width between clay or concrete pipes; however, the gaps between pipes seem to be smaller than in earlier times. The best filter materials are also subject to debate. Various tables give laboratory and field conclusions on the permeability of pipes, filters, and backfill. A table of maximum drainage areas is included. Since drainage has been sorely neglected in irrigated arid land systems, the information on cost and feasibility could have direct application in the future. (See also W75-09628) (Bowden-Arizona)
W75-09633

SURVEY OF EXPERIENCES WITH DRAINAGE MATERIALS AND REVIEW OF AVAILABLE SPECIFICATIONS,
Ministry of Agriculture, Fisheries and Food, Cambridge (England).
B. D. Trafford.
In: Food and Agriculture of the United Nations, Rome, Irrigation and Drainage Paper No 9, p 85-122, 1972. 2 append, 7 fig.

Descriptors: *Specifications, Design standards, *Drainage engineering, Europe, *Clay pipes,

*Plastic pipes, *Land reclamation, *Tile drains, Drainage, Construction equipment, Pipe, Filters, Soil filters, Irrigation, Arid lands, Subsurface drains, Manholes, Backfill, Reviews.
Identifiers: *Drainage materials, *United Kingdom.

England is increasingly using corrugated polyvinyl chloride pipe and trenchless draining techniques. National specifications for plastic pipe have yet to be established in the United Kingdom. Methods are presented for placing pipe. Materials used in addition to P.C.V. pipes, including baked clay pipes, pipe junctions, manholes, outfalls and filtering materials are described. A provisional specification for plastic land drainage tubes of up to 10 cm is presented with standards for immediate strength, creep strain, impact durability, longitudinal flexibility, water intake, water solubility and absorption, and resistance to exposure. A technical note from the Ministry of Agriculture, Fisheries and Food is appended giving guidance information to applicants for government aid in the installation of field drainage schemes. These guidelines are of interest to those areas similar in terrain to the United Kingdom and also to more arid areas. (See also W75-09628) (Bowden-Arizona)
W75-09634

8I. Fisheries Engineering

EFFECT OF HARVESTING METHODS ON PRODUCTION OF FINGERLING FATHEAD MINNOWS,
Colorado State Univ., Fort Collins.
M. L. Saylor.
Prog Fish-Cult. Vol 35, No 2, p 110-114, 1973, Illus.

Descriptors: Fish harvest, Minnows, Fish ponds, Harvesting, Mortality, Fish production, Seasonal, Temperature, Nets, Seston.
Identifiers: Draining, Fathead minnows, Fingerling, Pimephales-promelas, Seining, Sex.

Three harvesting procedures were used to remove fathead minnows, Pimephales promelas Rafinesque, from experimental ponds. The methods were complete periodic removal by draining, incomplete periodic removal by seining, and 1 complete removal at the end of the season. Periodic complete removal by draining increased total production in numbers of juveniles (fingerlings) by 41%. After the 1st harvest, draining harvested smaller fingerlings than seining did. Regardless of the method used to harvest fingerlings, 1% handling mortality was observed. The stocked optimum sex ratio and density of brood fish could not be maintained due to natural adult mortality. Water temperature and seston were interrupted by the drained harvest, but both recovered quickly after refilling and did not appear to retard production of fingerlings.--Copyright 1973, Biological Abstracts, Inc.
W75-09415

EXPERIMENTAL INTRODUCTION OF THE AUSTRALIAN CRAYFISH (CHERAX TENUIMANUS) INTO LOUISIANA,
University of Southwestern Louisiana, Lafayette.
J. V. Shireman.
Prog Fish-Cult, Vol 35, No 2, p 107-109, 1973, Illus.

Descriptors: Crayfish, Crustaceans, Louisiana, Growth stages, Ponds.
Identifiers: Australian crayfish, Cannibalistic crayfish, Cherax-Tenuimanus, Culture, *Marron, Pond construction, Reproduction, Temperature.

Since marron (C. tenuimanus) attain weights in excess of 4 lb and are extremely palatable, their potential for commercial production in Southern Louisiana, was investigated. Marron probably cannot exist in S Louisiana waters because of water temperature extremes, Even if established there are several factors unfavorable for commercial propagation. Pond construction would be costly since ponds would necessarily have to be deeper than existing crayfish ponds, and each pond should be enclosed so marron would not escape. If marron are density limited (to 100 ponds/acre), as Australian studies indicate, they are poorly suited for intensive culture purposes. Marron are cannibalistic; therefore size classes must be separated. This would necessitate rearing ponds which would not produce harvestable crops each year. The biological potential (growth and reproduction) is low as compared to native crayfish; it would take a number of years to realize returns on initial investments.--Copyright 1973, Biological Abstracts, Inc.
W75-09560

BRANDING CHINOOK, COHO AND SOCKEYE SALMON FRY WITH HOT AND COLD METAL TOOLS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 7B.
W75-09561

EFFECTS OF LOGGING ON WATER TEMPERATURE AND DISSOLVED OXYGEN IN SPAWNING BEDS,
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W75-09685

EVALUATION OF A NEW SPAWNING MAT MATERIAL,
National Fish Hatchery, Tishomingo, Okla. Warm Water Hatchery Biology Center.
For primary bibliographic entry see Field 7B.
W75-09749

CHARLES RIVER DAM, BOSTON, MASS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8D.
W75-09816

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

INFORMATION EXCHANGE ON WATER RESOURCES COMPUTER PROGRAMS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 7C.
W75-09591

10B. Reference and Retrieval

INFORMATION EXCHANGE ON WATER RESOURCES COMPUTER PROGRAMS,
Danish Hydraulic Inst., Copenhagen. Computational Hydraulics Center.
For primary bibliographic entry see Field 7C.
W75-09591

10C. Secondary Publication And Distribution

WATER ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W75-09372

SECONDARY IMPACTS OF TRANSPORTATION AND WASTEWATER INVESTMENTS: REVIEW AND BIBLIOGRAPHY,
Environmental Impact Center, Inc., Newton, Mass.
For primary bibliographic entry see Field 5C.
W75-09576

U.S. ENGINEERING INFORMATION SERVICES AND THE ROLE OF THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER,
Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 10D.
W75-09585

INDEX 1945-1966, LAND AND WATER.
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
PU: DC/Sp. 8, May 1968. 421 p.

Descriptors: *Bibliographies, *Land resources, *Documentation, Information exchange, United Nations, Foreign countries, Agricultural engineering, Land management, Water management(Applied), *Water resources, Soil conservation, Irrigation.

Gathering, selection, analysis, and indexing of the Food and Agriculture Organization publications and documents produced from 1945 to 1966 is in process and will cover successively the broad fields assigned to the FAO technical and economical divisions. The present index - the sixth of a series of Divisional and Departmental indexes - covers most of the publications and documents produced from 1945 to 1966 by the Land and Water Division. It contains some 1300 entries in the bibliographical list, from which the subject index and the author index were derived. (Scott-ISWS)
W75-09635

WATER FOR AGRICULTURE, ANNOTATED BIBLIOGRAPHY, AUTHOR AND SUBJECT INDEX.
Food and Agriculture Organization of the United Nations, Rome (Italy). Documentation Center.
DC/Sp. 27, 1973. 776 p.

Descriptors: *Bibliographies, *Agriculture, *Documentation, *Information exchange, Groundwater, Hydraulic engineering, Foreign countries, United Nations, Geology, *Irrigation water drainage, Fertilizers, Hydrology, Floods, *Water resources, Water resources development, Water management(Applied), Equipment, Water balance, Maps, Soil science.

Food and Agriculture Organization publications and documents related to water in agriculture and issued between 1945 and 1973 by the Land and Water Development Division and by other technical Divisions were indexed. A large number of documents arising from the activities of FAO contain some reference to water for agriculture. The present index is therefore a selected list consisting of documents in which these activities are a predominant feature or those directly supporting them, such as reports and working documents dealing with Soil Science. The index consists of three parts: an analytical index, an index by authors, and a bibliographical list. (Scott-ISWS)

W75-09636

BIBLIOGRAPHY OF U.S. GEOLOGICAL SURVEY WATER-RESOURCES REPORTS FOR UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2A.
W75-09718

10D. Specialized Information Center Services

U.S. ENGINEERING INFORMATION SERVICES AND THE ROLE OF THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER,
Office of Water Research and Technology, Washington, D.C. Water Resources Scientific Information Center.
R. A. Jensen.
The Journal of the Institution of Engineers, Australia, p 8-10, 12, 16, November-December 1974.

Descriptors: *Information exchange, *Information retrieval, *Water resources, *United States, Indexing, Abstracts, Publications, Bibliographies, Data collections, Water Resources Research Act, Thesauri, Documentation, Data storage and retrieval, Computers.
Identifiers: *Water Resources Scientific Information Center, Information analysis centers.

General subject areas discussed were: (1) the status of engineering information in the United States, (2) the role of the information analysis center in the engineering information system, (3) secondary services in water resources engineering, and (4) the Water Resources Scientific Information Center (WRSIC). The engineer operates in an information-communication pattern and has performed reasonably well within his present framework, however, there is mounting evidence that the existing engineering and information framework needs greater strengthening to meet the challenges of the future. The information analysis center comprises a group of specialists in science or technology, supplemented by librarians, computer specialists, and other information scientists, who acquire, select, store, analyze, evaluate, and synthesize information in their field of specialization. Such a center produces critical reviews, data compilations, measurement criteria, management recommendations, and other intellectual products requiring a high level of technical sophistication. WRSIC is an information analysis center which disseminates scientific and technical information for the U.S. water resources community. Input information to WRSIC is received from Federal water resources agencies, 51 State water resources research institutes, specialized documentation services, and approximately 13 designated centers of competence. Input information includes an abstract and index of each document entered on a precoded abstract form with other bibliographic data. Input from all sources, when merged, comprises a comprehensive, searchable, information base in machine-readable form. (Humphreys-ISWS)
W75-09585

10F. Preparation Of Reviews

WATER ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W75-09372

FLOW EQUALIZATION.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09381

NITRIFICATION AND DENITRIFICATION FACILITIES, WASTEWATER TREATMENT.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09382

WASTEWATER FILTRATION, DESIGN CONSIDERATIONS.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09383

PHYSICAL-CHEMICAL WASTEWATER TREATMENT PLANT DESIGN.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09385

UPGRADING LAGOONS.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09386

OXYGEN ACTIVATED SLUDGE WASTEWATER TREATMENT SYSTEMS, DESIGN CRITERIA AND OPERATING EXPERIENCE.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-09387

MUNICIPAL SLUDGE MANAGEMENT, PROCEEDINGS OF THE NATIONAL CONFERENCE ON MUNICIPAL SLUDGE MANAGEMENT.
For primary bibliographic entry see Field 05D.
W75-09532

MATHEMATICAL MODELS IN HYDROLOGY,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 02A.
W75-09624

WATER LAWS IN MOSLEM COUNTRIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Development Div.
For primary bibliographic entry see Field 06E.
W75-09625

URBAN RUNOFF POLLUTION CONTROL--STATE-OF-THE-ART,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 05D.
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